GAS JOURNAL

LIGHT ⁘ HEAT ⁘ POWER ⁘ BYE-PRODUCTS

(Founded in 1849 as the "Journal of Gas Lighting.")

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VOL. CLXXVII, No. 3324.] WEDNESDAY, FEBRUARY 2, 1927. [79TH YEAR.

Considerations Affecting the Coming Maintenance Conference.

A FORTNIGHT to-day the Maintenance Conference convened jointly by the Institution of Gas Engineers and the British Commercial Gas Association will be held in London; and it will be useful if, before then, those who participate in it refresh their minds regarding some representative instances of what has been done by undertakings of varying magnitude. That is the object of the digest which we present to readers in a Supplement to this issue of the "JOURNAL," with the view of providing suggestions for the discussion.

To our mind, the inspection and maintenance of consumers' appliances is a necessary complement to the service of the gas industry—in fact, it will become imperative; and therefore the sooner it is taken in hand, where not already installed as an integrant of commercial activity, the better for the present and the future of the undertaking. The question is purely one of policy, which can be viewed from the standpoints of expediency through change of circumstances, and propriety in the defence, retention, and expansion of business. The question of cost should not have primary consideration; the question of effects is more important in considering whether the policy is right. To consider effects, we have first to bring into view current conditions, then visualize the conditions of the future, and compare them with those of the past. Most gas suppliers have taken infinite pains to produce and distribute up to the meter gas of uniform calorific power, purity, and pressure; and now specific gravity is not overlooked in many cases. But they have left the gas and their care at the meter, to be dealt with as the consumer thinks best, if he thinks over the matter at all. The too frequent results are: Neglect, danger, inefficiency, and uneconomy, and a consumer in a frame of mind to listen to, and believe, what our competitors have to tell him. And who can honestly say that he is to blame? To allow that sort of thing to continue, by refusing to go beyond the meter, is an offence against our professions and claims regarding a greater efficiency and economy than our rivals can offer. If we so profess and claim, then we must see to the realization by properly conditioned apparatus; otherwise there dwells refutation in every house where there is waste through disordered appliances. If we can secure, as has been done in those supply areas where general and systematic maintenance is part of the service, the confirmation of our professions and claims, then that is an effect of the utmost importance to the undertaking concerned. It produces satisfaction on the part of the consumer, whose contentment with the service of gas is the strongest possible proof against the intriguings of the rival. That is an effect to which, in considering the question of policy, due weight should be given, not only from the point of view of retention of custom, but from that of increasing the connections of the consumer, as well as obtaining the recommendation which his contentment spreads among his circle of friends and acquaintances. While competition must be considered in connection with policy, we would emphasize the point that the promotion of efficient utilization is a moral duty upon gas administrations to their patrons, and to the interests of their undertakings.

Talking of competition, while we may be of opinion that the extent of electricity generation concentration and long-distance transmission which the Government scheme foreshadows will not effect all the good things predicted, we have evidence that the process of concentration of generation in the hands of the more imposing undertakings, and the supply in bulk of electrical energy to less fortunate neighbours, has had precisely the same result as is engendered by amalgamation or supply in bulk in the gas industry—that is to say, there has been a reduction in the charges to the consumers in the outer areas. We have also to recognize that all local authorities supplying electricity have now, through the new Electricity Act, wiring, hiring, hire-purchase, and selling powers; further, that they have adopted assisted wiring and bi-part tariffs, in order to help them to obtain consumers in (for them) new strata of our social constitution. We have to ask ourselves whether there have been changes, and whether others are not pending, in our competitive conditions which warrant our doing all possible in the matter of not only resistance, but, despite all counter activity, expanding our business. If the answer is in the affirmative, then we have got well along the road to the acceptance of the policy of maintenance.

So far, reasons and effects have been advanced which, we consider, alone justify the application of the policy. But there are other effects. One is that the putting of maintenance into practice involves a certain cost, which works out (experience attests) to a fraction of a penny per therm. That fraction of a penny is an assurance for existing business; it is a promoter of new business. Maintenance expenditure is productive. Not only is satisfaction engendered and upheld, but widespread testimony is that work inside consumers' premises brings in more orders for new connections than any other single propaganda method. This will be found in the review given in the Supplement. It is good business to increase consumption through existing services. On balance, there seems to be little or no doubt that the small additional cost imposed by maintenance—per therm, or on the hire charges—is neutralized so far as gas undertakings are concerned, and so it is in the case of the consumers by maintenance of efficiency producing economy.

With regard to the methods of maintenance, there is no formula for general application in designing a scheme. Experience can be taken as a guide, and plans be adapted to local circumstances. But the sooner maintenance schemes are adopted and applied throughout the gas industry, the better will it be for all its units. To enforce that truth is one of the objects of the forthcoming conference. We have to look ahead, and to be circumspect. If we do the former, and are the latter, there need be no fear regarding our changing environment. We are not alarmists. But, we say emphatically, the old ways of neglect the other side of the meter will not suit the trading conditions of to-day. It is past neglect in so many places that has been of the utmost advantage to our competitors. They could not have been served better or with more indulgence by their business rivals. But now the time has come when new circumstances command a new policy. Those gas undertakings which have not hitherto done those things which they ought to have done, should date their reformation from the maintenance conference of Feb. 16, 1927.

A Remarkable Year for the Gas Light Company.

FOR the Gas Light and Coke Company, 1926 was an eventful year; and it added notably to the history of our industry. In chronological order, there was the (for a single move) record absorption of the considerable area and system of the Brentford Gas Company; the great honour was done to the Company and the industry by Their Majesties the King and Queen paying a visit to Beckton, and spending an afternoon there inspecting the stupendous plant and the vast operations; H.R.H. the Duchess of York graciously opened the Company's new showrooms at Kensington; the President of the Board of Trade (the Right Hon. Sir Philip Cunliffe-Lister) and Lady Lister started new coal-handling plant at Fulham; the Chairman of the London County Council (Sir George Hume, M.P.) opened the Company's new training centre at Watson House; the Governor of the Company has received the honour of knighthood for invaluable national services, through the gas industry and on various Government Committees; and Mr. Henry Woodall has stepped into the Deputy-Governorship of the Company, on the retirement of Mr. J. Lister Godlee. That is a record of events for one year; and upon it is the remarkable fact that, notwithstanding a seven months' stoppage in the coalfields, and the additional responsibility of the old Brentford area, the Company, with their enormous consumption of coal, made 47,429,073,000 c.ft. of gas (or 237,922,825 therms, at actual calorific value), maintained statutory obligations in respect of quality and supply, and had an unaccounted-for figure of a little less than 4 p.ct. The consumers in the large area supplied by the Company have good cause to be grateful for the service rendered during the disastrous and unprecedented emergency, when gas stood successfully firm against the menaced fuel starvation of the country.

The accounts which Sir David Milne Watson will present to the proprietors on Friday will be investigated with interest to ascertain the effects—financial and technical—upon the concern; but those proprietors who are not immediately associated with the work of the industry should be warned that further effects of the stoppage will be reflected in the current year's accounts, owing to the overflowing of dearer coal into this year, and the changes there will be in the markets for secondary products—particularly coke. The conditions of manufacture were substantially changed through the coal stoppage; seeing that, roughly, 60 p.ct. of the gas distributed was coal gas, and about 40 p.ct. water gas—that is, taking the total output of a year in which four months were more or less normal. It may, therefore, be taken that during or at times in, the seven months' stoppage, the proportion of water gas was above 40 p.ct. The total cost of coal, oil, and coke for gas manufacture was £5,054,064, or £799,540 more than in 1925. That increase was distributed as follows: Coal, costing £3,923,981, increased by £409,929. On oil, £523,767 was spent, or £119,402 more; and on coke, £606,316, or £270,209 more. On the other hand, the secondary products brought in £2,381,351, or £371,447 more than in 1925. The contributors to this were: Coke, yielding £1,704,347, gave an increase of £246,317; breeze, producing £161,373, supplied an additional £44,583; and tar and tar products, bringing in £436,627, furnished an extra £108,419—the increases amounting together to £399,319. But ammoniacal liquor and sulphate of ammonia (chiefly through the position created by synthetic nitrogen) realized only £79,003, or a decrease of £27,873. Deducting this from the £399,319, there is the net increase of £371,447 for secondary products. The expenditure for gas-making materials last year being £5,054,064, and the secondary products yielding £2,381,351, we have a net cost for coal, oil, and coke of £2,672,713, compared with £2,244,620 in 1925, or £428,093 more, part of which would be accounted for by the nearly 2¼ p.ct. increase in consumption during the year. But to that figure is due, in the main, the gradual increase in the price of gas to the consumer from 9·4d. to 11·6d. per therm, from which there will be a reduction next March of 1·4d., leaving then an addition of 0·8d., as a reminder of the egregious folly of the Miners' Federation. The consumers have been well served by the Company's administration, technical and transport staffs (headed by the Chief Engineer, Mr. Thomas Hardie, M.Inst.C.E.), and workers generally; and the proprietors have had their interests protected through the wisdom of the Board in securing the embodiment in the sliding-scale of the 5 p.ct. minimum dividend.

Examining the year's working results, it is seen that the quantity of coal carbonized was 2,180,461 tons; and 31,019,589 gallons of oil were used. The quantity of gas made was 47,429,073,000 c.ft., as compared with 47,009,670,000 c.ft. in 1925—an increase of 419,403,000 c.ft. Expressed in therms at actual calorific value (502 B.Th.U.), the make was 237,922,825, or 1,748,995 therms more than in 1925. (Of course, in all these comparisons the Brentford figures are included for the year 1925.) Of the total make last year, 28,362,757,000 c.ft. were coal gas, and 19,066,316,000 c.ft. carburetted water gas—as already said, the proportions being about 60 p.ct. coal gas and 40 p.ct. carburetted water gas. The make of coal gas per ton was 13,007 c.ft., compared with 13,257 c.ft. in 1925. Assuming that the coal gas last year was at the actual calorific value of the total gas supplied, 502 B.Th.U., it would only represent 65·4 therms per ton, against 71·67 (on works tests) in 1925. This tells a tale of unaccustomed poor coal qualities and characteristics of some of the supplies from abroad, and it also accounts for the additional consumption of oil per 1000 c.ft. of water gas made—1·62 gallons last year, compared with 1·33 gallons in 1925, and 1·1 gallons in 1924.

The appeals during the coal strike for the greatest possible economy in consumption did not result in a reduction upon the year, as already seen by the mention of the nearly 2¼ p.ct. increase. It must not be overlooked that, though some industrial works suffered from an enforced drop in activity or a total closing-down, domestic consumers were largely confined for fuel to the service of gas. The quantity sold during the year was 45,044,486,000 c.ft.—an increase of 1,012,847,000 c.ft. At actual value (502 B.Th.U.), the sale was 225,961,683 therms—an increase of 4,749,696; at declared value (500 B.Th.U.), the sale was 225,222,430 therms. The total gas rental was £8,930,304—an increase of £818,203, to which meter supplies contributed £816,213, and public lighting and contract supplies £1990.

This is a highly satisfactory showing, and more so in the abnormal circumstances of the year. With it the proprietors cannot fail to be pleased, or with the evidence of the broadening of the basis of the business. The roll of customers has during the year increased by 24,699; and the stoves sold and let on hire have had their number advanced by 112,732—a testimony to vigorous demand and excellent trading methods. Meter and stove rentals have also risen. Meter rents account for £290,296, or £30,902 more; and stove rentals have ascended, by £57,885, to £432,268. At £488,501, the rental of fittings is less by about £2000. We all know the thorough and systematic manner in which the Company are looking after the gas-consuming appliances in the homes, business premises, and factories of their customers. The work is having splendid effect. Under the heading of distribution in the revenue account, another result of this is seen. But the figures speak of business protection and development; and expansion is the note that comes from the sums charged in the capital account for additional mains and service-pipes, meters, and stoves. The items are expressive to those of us who dwell within the gas industry; and they are an assurance for the future.

Without examining other details of the accounts, but going direct to the final results of the year's operations, the total expenditure on revenue account was £11,210,772, or £1,449,456 more than in 1925. The income was £12,548,619, or more by £1,277,268—due to the increase in business, higher charges for gas, bigger receipts for meter and stove rental, and the better prices obtained for all secondary products, save sulphate. The balance on revenue account is therefore £1,337,846, or £172,189 less than in 1925. How the net profits are being distributed will be seen from the Directors' report on a later page. That the position is so good, in such unexampled circumstances as those with which the Company had to wrestle last year, shows fine administration and work throughout the gigantic concern.

The Top Place of High-Temperature Coke.

IT is wonderful how little is known of the virtues and possibilities of high-temperature coke. Men speak ill of it—not because it deserves it, but because they misuse it, and do not attempt to get out of it all its heating property. If they did so, they would find that it is not so much (though they are not negligible factors) its calorific power or its moisture and ash contents, but its carbon percentage that is the important thing. At all events, that is the conclusion that Mr. Harald Nielsen seeks to enforce in an article on "Fuel Relativities" which appears in this issue of the "JOURNAL," and which, like all his work, bears the impress of the student who is not satisfied until he gets at the root of the matter in hand. He has struck out a new line of investigation. When he had occasion to consider the relative values of fuels, he discovered that those realized by preceding investigators were fallacious, inasmuch as they are not substantiated in general practice, and do not take into account the whole range of factors. The work Mr. Nielsen has now done opens up a new vista in respect of gas-works coke, and may impel further investigation. Anyway, it warns us against accepting with confidence the results secured on an incomplete basis. This being so, and as his research does indicate that, "proceeding along certain lines, specific equivalent figures can be obtained which not only meet practice, but do not include any doubtful elements so far as present-day knowledge goes," the expenditure of time he has given to this additional enrichment of the subject of fuel has brought worthy enlightenment.

In his article, Mr. Nielsen carries us from a statement of the factors he has employed in making his research to the results given in Table II., which is a compilation concerning a number of solid fuels which has to be studied thoroughly and critically to secure from it its wealth of information. Pure carbon is employed as the standard of comparison; and, examining all that follows (unless critics can detect some flaw or error in computation), it it seen that the closer the fuel approaches pure carbon in composition—the lower its volatile content—the more efficient the fuel is. Hence a low volatile coke, like gas coke or metallurgical coke, seems as near to the ideal as possible. So is anthracite. Having arrived at that stage, we are at once brought up against the practical difficulties in regard to the combustion of high-temperature coke, which is covered with a graphitic carbon film, neither very reactive nor easily combustible unless—mark this!—the coke is finely pulverized, or forced draught is employed, as well as high temperatures. In these evolutionary times, the reference to pulverization is highly important; and it should be followed up to the goal of placing gas coke in its position of *par excellence* among the fuels and among industrial fuel users. Used in the pulverized form, the theoretical flame temperature is higher, the flame radiation is higher, and the mean specific heat of the combustion products is low. Further, the apparent specific weight in powdered form is relatively high; hence more heat energy per unit volume in powdered form can be carried than (for example) is the case with a non-coking high volatile raw coal, or for that matter any raw coal, except anthracite. Traceable to the same reasons is the fact that the "Sandwich" system of firing boilers is eminently satisfactory in respect of efficiency—*i.e.*, the admixture of high-temperature coke (mainly carbon) with coal produces higher flame temperature, greater radiative effects, and combustion products with a lower specific heat.

If we consider these points, which are patently theoretically and practically sound, and keep in mind that a high calorific fuel does not necessarily mean one which can be burned more efficiently than another of somewhat lower calorific value, then a strong appeal is made to gas-works to examine into the question of the course that should be taken to convert the theoretically highly efficient coke into an all-round efficient fuel. But the main difficulty is the graphitic carbon. Mr. Nielsen enlarges upon the question of what would have to be done by gas-works to bring about the increase of the efficiency value of its solid fuel. No one can deny that, if greater profit attaches to it, and the market for coke is stabilized thereby, a change in the mode of procedure might not be impracticable. Our contributor asks the pertinent question, Why should not gas engineers be the producers of the best and most efficient all-round fuel at the same time as they produce gas? It means pulverizing the coke for industrial purposes. Of course, gas-works are meeting with more success now in the sale of graded coke for different domestic purposes; but still, with the increasing demand for gas, the prospect is that gas undertakings will be producing more and more coke, or effecting a balance between demand and production by a greater use of water gas or complete gasification plants. It is all a question of the procedure which is economically the best. By educating industrialists up to a knowledge of what Mr. Nielsen shows us, the aspect of the coke market in normal times might be completely changed. As stated in previous articles, we are strong believers in reinforcing commercial position by diversity of trading through the incorporation of appropriate auxiliary business; and the supply for steam-raising of powdered coke, which is demonstrably the most efficient fuel owing to the constituent factors and the resulting combustion effects, is worth consideration. Mr. Nielsen rubs-in the point by illustration. Take alone the mighty Beckton Works of the Gas Light and Coke Company and the East Greenwich Works of the South Metropolitan Company, provided the coke produced could be burned practically as powdered fuel, they would represent by far the biggest and most efficient power stations in the world—larger than all the water-power stations combined.

There is much else that is informative in the article. But, in conclusion, a brief glance at Table II. to illustrate the lessons it supplies. There Mr. Nielsen presents the data to justify the submissions he makes for the consideration of gas technologists. The figures show that it is not the percentage of ash or the calorific value of the fuel, but the carbon, which gives a fuel its relative place in the column headed: "Net heat carried in even bulk as "powdered fuel." Take pure carbon as representing: Carbon, 100; ash, *nil;* calorific value, 8100 calories per kg.; and the relative heat carried in bulk as powdered fuel as 1. Then low volatile high-temperature coke (with its 85·2 p.ct. of carbon, 12 p.ct. of ash, and 7010 calories) comes second with 0·866 as the net heat carried in even bulk as powdered fuel. "L & N" fuel from a non-coking coal (with 83·14 p.ct. carbon, 5·5 p.ct. ash, and 7410 calories) ranks third with 0·755 net heat carried in even bulk as powdered fuel. The non-coking coal from which this "L & N" fuel was made (with 75·69 carbon, 3·4 ash, and 7090 calories) gives only 0·676 as the heat carried in even bulk as powdered fuel. Wherever we look in the table, we see the same thing: Despite variable ash and calorific power, the net heat carried in even bulk as powdered fuel follows unfailingly the percentage of carbon in the fuel. The figures, if positively error-free, establish the fact that low-volatile, high-temperature coke, in powdered form, is paramount among the fuels in respect of heat efficiency. This finding should set our fuel technologists on a new track, and promote the demand for pulverized gas coke for steam-raising.

The Coke-Oven Gas Problem.

IN a paper which Dr. E. W. Smith read last Wednesday before the Midland Section of the Coke-Oven Managers' Association at Sheffield, he elevated the question of the utilization of coke-oven gas for town purposes from the commonplace one of production and delivery into local holders to the platform of thorough technical practice, to which it has not yet attained—at any rate, in this country. The desiderata are: Constancy of supply; a quality of gas which in all respects complies with the statutory requirements of the distributing recipients of it; a condition of gas which will preserve the integrity of the transmission pipe-line; and a cost which will justify the receiving gas-works discontinuing manufacture in part or in whole on their own works. The security of supply and the cost at which a gas-works can afford to relinquish manufacture on their own account are questions which hang together very tenaciously; and there is not an item which can be overlooked, because upon the gas suppliers lies

the responsibility of constancy of supply to their customers, and the interests of their own undertaking will not tolerate the interruptions to which they find coke-oven gas supply is liable. That is the biggest problem in the whole matter. Get that solved, and confidence established, and coke-oven gas would be worth more to the town supplier than it is to-day. It is upon that question there must be concentration. Experience has already provided the information that is required regarding overall costs of transmission, including compression, for varying qualities and conditions of gas; and, when the problem of assured continuity is solved, it will then be possible to turn freely to those questions which will ensure a greater technical efficiency for such a supply—such, for example, as that of drying the gas, important as it may be, and is, in respect of transmission.

There can be no question that, in the general economy, the proper destination of coke-oven gas is the distribution mains of our cities and towns. Therefore one can freely support what, from the practical point of view, we regard as of the utmost present importance—that is, the suggestion with which Dr. Smith winds-up his paper, that the National Fuel and Power Committee should report on the practicability or otherwise of the extended use of coke-oven gas for town supply, and determine what means can be adopted for maintaining continuity, and what general principles can, with advantage, be observed in drawing-up specifications and determining prices. That is an imposing, but essential, matter for the Committee to take in hand. They are at the outset faced with the fact that, though the coking plant owners are desirous of increasing the revenue from their carbonization process by selling the resultant gas to the purchasers who can make best use of it, and can therefore afford to pay the best price for it (consistent with their own price ability in manufacturing gas, and the costs incurred through becoming buyers instead of makers), they have never yet been able to offer any practical suggestion as to how diminution of the supply can be averted in times of bad demand for industrial coke, nor how a full supply can be assured during times of trouble in the coalfields. The latter, of course, is the more important; and to overcome the present difficulty is an intricate problem, which, we are afraid, can only be settled by a complete change in conditions, and probably by legislation. From this it will be seen that the suggestion that the National Fuel and Power Committee should take this point into consideration is a good one—in fact, is one which they cannot neglect if they are going to make a complete job of their advisory office—but it is not by any means an easy question.

Before the great coal stoppage, we heard whisperings of coke-oven managements who, while hoping for an extension of the use of their gas for town purposes, were contemplating asking higher prices for it. But it must always be remembered that there is no compulsion on gas undertakings to buy; and our coke-oven friends will not take it as hostility, but only as prudence, when we say that (even if through statutory protection or some other way) assurance could be given that there would be no break in supply, gas undertakings would always have to retain the right of new contracts being made a considerable time before the termination of an old one, so that, if price was not satisfactory, having regard to any new economies in gas manufacture, their own plant could be put in order or modernized, or new plant erected. We are, however, far from the stage when assurance can be given that there will be no interruption in supply from coke-ovens, through labour disputes or other causes. Therefore, it is not a propitious time to talk of higher prices, which anyway must be below cost of local production into the holder. Dr. Smith shows that the purchase in bulk of coke-oven gas, with stoppages as a factor in the situation, involves the gas undertaking in the maintenance, probably modernization and extension, of local gas-making plant. It also means that a gas undertaking must maintain coal stocks against interruption of supply; also that they must be able to place their hands on men capable of operating the stand-by plant in times of emergency. All these capital and maintenance costs must be taken into account in fixing the price which the gas undertaking can afford to pay for the coke-oven supply. It is not a question simply of the relation of the price of the coke-oven gas to the cost into the holder of home-produced gas. There is something over and above that, due to the conditions of the coking industry; and it is those conditions which narrow the price that a gas undertaking can economically pay for coke-oven gas, and the price the producers of that gas can command. If these conditions can be surmounted, then the coke-oven industry would find its position enormously strengthened for bargaining with gas undertakings.

To the detailed consideration of such questions as these Dr. Smith rightly gives the prominence of first place in his paper. The second part treats of the costs of transmission (including compression) from the coke-ovens to the district holders of the gas distributors, and the purification and drying of the gas. Of primary importance, however, is continuity of the supply. When that is gained, technical development will follow; but the uncertainties that brood over the relationships of the two industries in respect of gas supply impose a limit to any expenditure on technical development on the side of the coking industry which can possibly be avoided. Nevertheless, to have a programme of such development, and the discussion of its elements such as is found in Dr. Smith's paper, is both valuable and contributory to progress.

The Fuel Chemist.

The developments which are taking place in relation to the efficient utilization of our fuel supplies, convince Professor John W. Cobb that no branch of chemistry provides better opportunities for the right type of man than does fuel. He has been dealing with this subject in a paper before the Institute of Chemistry, and has laid before the members what he conceives to be the proper line of training for men who are going to devote themselves to fuel. The matter is one in which the gas industry is deeply concerned, owing to its huge coal bill, its large production of fuel, and its use of fuel in all its manufacturing processes—whether for the primary product, or in connection with the secondary ones. And the gas industry has to study the fuel problem more and more if it intends to keep abreast of the applications of fuel in other industries. Nowadays, a chemist with a training in fuel is highly essential to a gas undertaking—not only inside the works, but outside, for he should be very valuable in connection with the development of the industrial applications of the gaseous and solid fuels produced at the works. In view, too, of what is disclosed by Mr. Harald Nielsen in an article in the "JOURNAL" this week, the gas-works fuel chemist may, in many instances, have to deal with the best methods of utilizing coke in pulverized form. A summary of Prof. Cobb's paper is published in our columns this week.

Quenching Coke with Producer Gas.

At the Kiel Gas-Works, there is now a plant for the dry quenching of coke—not as hitherto with inert gases, but with combustible producer gas, from which all air is excluded. The idea is that, if producer gas is so employed, all necessary preheating can be achieved without either regenerator or recuperator. It is also believed that the producer gas obtains enrichment from any part of the coke mass not completely carbonized in the ovens, from the formation during quenching of water gas, and the reduction of carbon dioxide to carbon monoxide. In addition, waste heat is available for steam-raising, to which (with this plant) is attributed an efficiency of 81 p.ct. The steam so generated is consumed by the electricity works, which are situated next to the gas-works, and are under the same management. Details are given of this novel plant in an article in other columns.

Flueless Houses.

The correspondence on flueless houses has been continued in "The Times." We referred to it in the editorial columns last week. The additional comments which have been made in our morning contemporary have not been of a character of which many electricians will approve. As a matter of fact, the correspondents, with one exception, appear to be unanimously of opinion that flueless rooms should not, in the cause

of health, be tolerated. A particularly practical letter appears from Dr. Leonard Hill, whose authority in the matter of pure air in relation to health stands in the forefront. He quotes the relative costs of different heating agents from Dr. Margaret Fishenden's book on "House Heating." His advice to his readers is that it is much the cheapest to use an independent coke-boiler for giving a continuous hot water supply, and to burn coal or anthracite in a room which is to be warmed continuously. It is also convenient, clean, and cheap to employ gas cookers and fires where intermittent use is required; and he impresses the fact that electricity can only be employed cheaply by people who want merely occasional artificial heating. The layman is informed by him that this is because of the enormous waste of the potential energy of the coal in the production of electricity. Naturally, for other fuels, flues are needed; and Dr. Hill therefore submits that it would be wrong to build flueless houses for people of small incomes. This is only common sense; but the electricians refuse to recognize it. This authority also says it must be borne in mind that flues secure an adequate and unnoticed ventilation for those who like to shut themselves up in warm air—ventilation which lessens the danger of catarrhal infections, and prevents stagnation of body heat. Natural ventilation, he adds, through the chinks and crannies of door and window, generally suffices to prevent any significant chemical impurity of the air. For domestic heating in our changeable and sunless climate, a fire has great merits, but to get rid of smoke pollution and all the vast loss it entails, we should, as far as possible, use smokeless agents. By the combined production of gas, coke, and electricity, Dr. Hill submits great economy could be effected. The heat at present wasted might then be largely used.

Coal Output.

During the week ended Jan. 15, the production of coal amounted to 5,244,700 tons; the number of workers of all classes employed being 978,900. This gives an average production of 5·357 tons per worker. In the week ended Jan. 16 of last year, 1,092,000 workers were employed; and the production was 5,460,800 tons, which gives an average of 5 tons per worker. The difference in production, when multiplied by the number of workers engaged, needs no comment to impress its economic value.

Leeds University Extensions.

Some months ago, we made an announcement regarding the appeal of the Leeds University for £500,000 for a scheme of extension. The great ambition appears to be now fairly on the road to realization. In open competition, architectural designs have been submitted; and the first premium (£500) goes to Messrs. Lanchester, Lucas, and Lodge, of London, and the second (£300) to Mr. J. C. Procter and Mr. Joseph Addison, of Leeds, who have been working in collaboration. Dr. P. S. Worthington, the Assessor appointed by the President of the Royal Institute of British Architects, in his report, refers to the lay-out of the plans submitted by the winning firm as incomparably the finest submitted; and he congratulates the University on having secured a fine solution to a very difficult problem. Of course, some time must elapse before tenders can be received and building begun; but it is anticipated that it will be possible to commence operations during next autumn. The buildings it is proposed to erect first are the Physics and Chemistry block, in order to replace the accommodation which will be removed in the old buildings to make way for the new Library. The Library and Mining Departments, it is stated, will follow.

Export Coal Prices.

It is stated that there has been during the past few weeks a serious decline in the f.o.b. prices of coals for abroad; but this is mainly due to temporary conditions. For example, coke-ovens are to-day operating up to barely 50 p.ct. of their capacity. The iron and steel industries are working considerably below their normal capacity, and many works have not yet restarted. Owing to the high cost of pitch, the majority of the patent fuel works in South Wales are said to be idle; while under normal conditions the small-coal consumption of this industry is over a million tons per annum. Then, again, the foreign demand for coals is still suffering not only from the deliveries abroad of German and American coal, but also from long-period contracts placed for those coals, extending up to the end of March, and in some cases even up to the end of June. Our own railway companies and certain gas undertakings are still importing coal under contracts placed by them during the period of the strike. Mr. Finlay A. Gibson, Secretary of the Monmouthshire and South Wales Coal Owners' Association, believes that cargoes of foreign coals will continue to arrive up to the end of February, which means that, apart from the limited industrial demand in this country, such deliveries will displace our own home-produced coal. Practically the whole of these conditions are due to the length of the coal stoppage; but as they are gradually removed, so the demand for British coal will, having regard to the season, be increased, and greater price stability will be the effect.

Home Coal Prices.

In connection with the foregoing, it is noticed that Mr. Gibson considers it is idle to compare present prices for coal with those ruling last April, and to contend that prices must fall to the level that then existed. He points out that in April there was a loss, excluding the subsidy, of over 3s. per ton, and that the coal industry cannot continue on such a basis. Not only must the loss be made good, but the industry must also obtain a profit. Consumers are looking for the promised economies resulting from the introduction of the eight-hour day to afford some compensation; but Mr. Gibson declares that the change of hours cannot balance the whole of the previously existing deficiency.

Unemployed.

The registers of the unemployment exchanges showed that on Jan. 10 there were in Great Britain unemployed to the number of 1,432,000. This was 63,839 less than in the previous week, but 210,597 more than in the corresponding week of last year. During the week ended Jan. 17, there was a further improvement in employment. The number on the registers was 1,391,000, which was 41,014 less than in the previous week, but 175,125 more than a year ago. This is satisfactory.

PERSONAL.

Mr. CHARLES WOOD, the Bradford City Gas Engineer, on Jan. 27 left the London nursing home where he has for some weeks past been undergoing treatment for neurasthenia. He is expected to go away to recuperate before returning to duty in Bradford.

Mr. C. A. NEWHAM, Assistant Superintendent at the Basford Gas-Works, Nottingham, has been appointed by the Leeds Gas Committee Assistant Manager at the Meadow Lane Works of the Leeds Corporation Gas Department. Mr. Newham was selected from 79 applicants.

There were 76 applications for the appointment of Distribution Superintendent at the Lancaster Gas-Works; and Mr. J. GRAHAM, District Superintendent at Kilmarnock, was successful.

Mr. JAMES DINGLEY, who retired on Oct. 31 from the position of Assistant Secretary to the Birmingham Gas Department, has been the recipient from the Gas Committee of an illuminated volume containing a resolution expressing warm appreciation of his long, efficient, and devoted services to the Gas Department and the Corporation. Mr. Dingley was for 25 years in the service of the Gas Department, and for 17 years with the Town Clerk's Department. The gift was made by the Lord Mayor (Alderman A. H. James); and those speaking in support were the Town Clerk (Mr. Wiltshire) and Alderman J. H. Lloyd (the Chairman of the Gas Committee). A number of gifts have also been made to Mr. Dingley by his colleagues in the Gas Department.

Cornish Association of Gas Managers.—At the Annual Meeting of the Association, held at Truro on Jan. 28, Mr. S. J. Ingram, Managing Director of the Truro Gas Company, was unanimously elected President for the ensuing year; while Mr. F. G. Kingwell, of Falmouth, was re-elected Hon. Secretary. The retiring President, Mr. F. R. G. Grant, of St. Ives, was accorded a cordial vote of thanks for his services.

OBITUARY.

BENJAMIN WILLIAM SMITH.

It is with much regret that we have to record the death, which occurred at his residence in Lichfield Road, Walsall, last Wednesday morning, of Mr. Benjamin William Smith, who for a great many years was a well-known and highly respected Gas Engineer in the Midlands. He will be much missed by the members of the Midland Association of Gas Engineers and Managers, whose President he was as long ago as 1893, and in whose proceedings he always took an active part.

Mr. Smith's earliest experience in gas engineering was at the Pará Gas-Works, in Brazil, where he served for five years under Mr. A. F. Wilson. After that he was a short time in the laboratory at the Fulham Works of the Gas Light and Coke Company; and then he spent upwards of seven years with Mr. Henry Hack at the Saltley Works of the Birmingham Corporation Gas Department—first as draughtsman, then as chemist and analyst, and finally as general assistant. In July, 1881, he was appointed Engineer and Manager of the Smethwick Gas-Works, which had been erected on the transfer of that district from the supply limits of the Birmingham Corporation to the Smethwick Local Board, who secured the services of Sir F. J. Bramwell, F.R.S., in providing themselves with their own works. At Smethwick Mr. Smith remained for nineteen years, during which time the make of gas was more than doubled, and a great deal of work, including the erection of a retort house on the inclined principle, was carried out.

His final move in the gas profession was to Walsall, of which undertaking he was appointed Engineer and Manager in May, 1900, in succession to Mr. W. Gorse, who had taken the position on the resignation of Mr. John Tindall. On his leaving Smethwick, the employees of the Gas Department presented Mr. Smith with a marble timepiece, bearing a suitable inscription. The pleasant relations that had subsisted between him and the employees were then emphasized. Mr. Smith's successor at Smethwick was Mr. Vincent Hughes.

Again at Walsall Mr. Smith found much work to do; and his alterations and additions to the Pleck Gas-Works formed the subject of a series of illustrated articles in the "JOURNAL" during the first half of 1902. After nearly twenty-three years' service, Mr. Smith resigned his position as Gas Engineer and Manager to the Walsall Corporation as from March 31, 1923; and, on the recommendation of the Gas Committee, the Town Council, in consideration of his work, granted him an annual allowance. On his retirement he was the recipient of a gift in the form of a cheque from the chief officials of the Corporation. The Town Clerk (Mr. H. Lee), who presided on the occasion of the presentation, remarked that Mr. Smith carried with him the best wishes of his colleagues. The Borough Surveyor (Mr. J. Taylor) referred to Mr. Smith's long and successful service under the Corporation—stating that since his appointment 23 years back he had almost entirely reconstructed the works, and had helped the rates to the extent of many thousands of pounds. Mr. Smith's successor at Walsall was Mr. Fred Davies.

Deceased, who was 75 years of age at the time of his death, leaves a widow, a daughter, and three sons.

The interment took place on Saturday last, the 29th inst., at Rushall Parish Church, when there were present representatives of various gas bodies with which Mr. Smith had been so prominently associated during his activities in the Midlands. The Walsall Town Council were represented by His Worship the Mayor, Councillor J. A. Leckie (Chairman of the Gas Committee), Councillor W. Forsyth (Vice-Chairman of the Gas Committee), and a number of head officials in the various departments of the Corporation. Floral tributes were sent from the Gas Associations he was connected with. The Midland Association of Gas Managers were represented by Mr. F. C. Briggs, of Dudley, the President of the Association. The staff from the works were well represented.

ELECTRICITY SUPPLY MEMORANDA.

ALL the prognostications went astray as to the first occupant of the chair of the new Central Electricity Board. No prophet had marked the name of Sir Andrew Rae Duncan, who is (as announced in the "JOURNAL" last week) to be the head of that responsible body. The Board, by the way, will be relieved of much of the initial work they would otherwise be called upon to do by the sanctions that have already latterly been given by the Electricity Commissioners to certain formidable extensions of existing power stations or new ones of the super-power type. Whether or not the Board will be pleased, cannot be said; but the Electricity Commissioners will now be able to say that they had a large part in the scheme of generation reformation which the recently born Act empowers. It is learned from a speech by the Rt. Hon. Wilfrid Ashley (Minister of Transport), at the recent annual dinner of the Electrical Contractors' Association, that the number of letters he has received offering services on the Board has run into thousands. No end of people believe that they are fitted for a lucrative office such as will be that of a member of this Board. But their own estimate of capability may not correspond with that of those whose function it is to make the appointments. There will be some people who believe their intellectual equipment to be equal to the position and responsibilities of the Chairman of the Board, and who will harbour the idea that Sir Andrew Duncan is displacing more desirable men; there are also men in the electrical profession who will question the propriety of a man who is not professionally one of themselves occupying the headship of a body who will have to adjudicate upon problems of an intricate and highly technical nature. Sir Andrew is a man we all admire for what he has been and for what he has done, particularly at the end of the war as Coal Controller; but we should not be disposed to enter into any controversy with those who are of opinion that a more intimate knowledge of the technical side of the electricity industry would have been an excellent thing in the Chairman of the Electricity Board. Perhaps there will be compensations when the ordinary members of the Board are appointed.

Chairman of the Central Board.

Among other remarks which the Minister of Transport made at the dinner referred to in the preceding paragraph, was one that, as the Electricity Supply Bill has now become an Act, it is the duty of all citizens to see that it is carried out, and made the best of. All citizens will not have the opportunity. He also said the Government did not rush into this matter without prolonged and certain investigation. There is one important thing that the Government omitted from their investigation, and that was to ascertain what the electricity industry thought of it. On the contrary, they kept their plans mightily secret until the Bill was framed; and so they have only themselves to blame for the hostility which the scheme provoked. It is true the Act is the law of the land; but it is opposed to common sense to expect that men who are persuaded the scheme will not fulfil all the predictions of its sponsors will set to work in the same whole-hearted spirit as if the scheme was one in which they had complete faith. The assurances which Lieut.-Col. Ashley gave at the dinner that the Act was going to do much for the industry were not received with that unanimity and enthusiasm which would have delighted him, though courtesy to a guest dammed back the real feelings which existed among, at any rate, part of the company.

A Duty and the Spirit.

However, the Minister of Transport was right in thinking there is one feature of the Act which does give gratification to the industry, and that is the clause which empowers local authorities generally to wire premises and hire and sell electricity consuming appliances. In this connection, he held the gas industry's propaganda up as an example to the electricity industry. He said that in this country up to now there has been more attention paid to generation and less to salesmanship than is right. At the risk of saying something which might not be appreciated, he thought the electricity industry has still something to learn from the gas industry. The gas industry knows how to push its wares; it has been most successful, and is a pattern to the whole world. If with the advantages the Government has given the electricity industry in "cheap" generation they will do their part, and will further push the uses of electricity in the home, then he feels they will be able to look the whole world in the face, so far as electricity is concerned. We will leave it at that; for the general confidence in the electricity industry is not that which Whitehall professes to entertain. Successful propaganda requires cheaper electricity. Will the electricity generation scheme provide that at the consumers' terminals?

Gas Propaganda a Pattern.

The electricity supply industry is not finding that water heating by its commodity is going forward with that enthusiasm on the part of the public which they would like to see. In connection with the use of immersion water-heaters, in addition to the degradation which comes about in promptitude of supply, and the latitude allowed to householders by other agents, together with the uneconomy, it is found in some districts that this method of heating water develops attendant troubles. It can well be imagined that in areas where the water has a high degree of hardness, such as well water in chalk areas, that the immersion heater and the inside surface of the tank will fairly quickly get incrustated, with the result that the heating efficiency will be gradually reduced, and even such convenience

Electricity and Hot Water Supply.

as these appliances may originally possess will be seriously depreciated, to the permanent discontent of the user. Naturally, the only thing that can be done is, as in the case of other water-heating apparatus, periodically to clean out the tank, and either clean or renew the immersion heater. In the case of the tank with its electrical fittings, it can well be understood that this process would be somewhat more laborious and expensive than in the case of more accessible heaters. A correspondent of the "Electrical Times," Mr. F. C. Dain, of the Corporation Electric Showrooms, Blackburn, states that he recently had installed in his house an electrical water heater, and that he is troubled with a bad discoloration of the hot water. The heater is of the storage type (10 gallons capacity), loaded to 500 watts, on a 230-volt supply, A.C. The thermostat is operated approximately between 120° and 160° Fahr. The make of the tank is continental; it is efficiently lagged, and the whole is covered by a white enamel casing. When hot water is drawn off, the first tablespoonful is very sedimentary; but the next two or three gallons are fairly clear; but each succeeding gallon the discoloration is more marked, until the sixth gallon or so is of a deep rust colour. He asserts that he experienced similar trouble at Manchester some eighteen months ago, with a storage heater of like design, but of different manufacture. We have no knowledge of the chemical characteristics of the water in the Blackburn district. Assuming the water is moorland derived, it may be that its acid properties are somewhat high. If this is so, it is possible that the water might affect some metals more than others. It will be essential for the electricity industry to study this matter of the characteristics of water in conjunction with the metals of which their heaters are made. From the statement in Mr. Dain's letter, one would imagine that it is a case of corrosion, and rust deposits at the bottom of the tank.

Business Developing Methods.

Despite what Lt.-Col.. Ashley said in his speech referred to in the earlier paragraphs of this week's "Memoranda," it must be admitted that the electricity supply industry is bringing to bear upon its development a combination of conditions which cannot fail to produce expansion. We can leave for the moment the question of the concentration of electricity generation in a comparatively few super-stations in the country. The fewer there are, the greater will be the transmission costs incurred. Concentration is imperative within limits. But there can be over-concentration; and it is in this that excessive transmission costs and losses are likely to be incurred. In an article which Mr. W. B. Woodhouse, the Manager of the Yorkshire Electric Power Company, contributed to the "Yorkshire Post" on Jan. 13, he summarized the developing work the electricity industry has in hand. Allusion has already been made to the wiring, hiring, and selling clause in the new Electricity Act. Mr. Woodhouse states that the majority of new houses now being built in the West Riding are being wired for electric lighting; and provision is being made for the use of radiators, electric irons, and other apparatus. He believes that this development has been largely encouraged by the general introduction of methods of charging by which the domestic user automatically pays a lower price in proportion to the amount of electricity consumed. These methods are proving increasingly popular, and in many cases are sufficiently attractive (Mr. Woodhouse asserts) to justify the householder in entirely ceasing to use coal. Of course, he is referring to the bi-part tariff, under which a primary lump sum is paid, with a small secondary charge per unit of electricity consumed. Again, special efforts are being made to supply electricity to dwellers in cottages and other small houses by means of assisted wiring schemes (in which the charge for wiring the house is paid for by instalments), and by the hire and hire-purchase of electrical apparatus. It is the view of Mr. Woodhouse that these methods of development will largely increase during this year; and he finds that makers of electrical apparatus are looking forward with confidence to a record development.

Purchase in Bulk Effects.

In a later part of his article, Mr. Woodhouse demonstrates the advantage of small uneconomical stations closing down, and becoming identified, as purchasers in bulk, with the system of a larger concern. The Yorkshire Electric Power Company in their large area have not concentrated all their generating plant at one point, but have in operation several stations, which statement also applies to the big concern which operates on the North-East Coast. But confining ourselves to the Yorkshire Company's area, and to the article, we quote the following:

> The tendency to shut-down the smaller stations and to take a bulk supply is continuing. The most recent decision is that of the Shipley Council, whose station has been in operation since 1901. They have now decided to shut-down, and to take the whole of their supply from the Yorkshire Electric Power Company. It is estimated that a saving of £2000 per annum will result. In this connection, it is interesting to note the rapid development of those small undertakings which, originally possessing generating stations, have done away with them, and taken their supply in bulk. The Brighouse Corporation shut down their station in 1910; their output is now nearly twenty times greater, and their undertaking shows a profit, instead of a loss. The Spenborough District Council have in the last six years doubled their output, and have reduced their price by one-third. The Todmorden Corporation have not only increased their output five times since 1921, but have reduced their price by half. The Elland District Council have nearly trebled their output in the past five years, and have halved their price. The Holmfirth District Council have, since 1923, increased their output sevenfold, and have reduced their price nearly fourfold. The Heckmondwike District Council, which commenced taking a bulk supply in May, 1924, have already made a considerable reduction in price, and their profit has been increased nearly six times. In each of the above cases, the undertaking had been worked at a loss until it was decided to close the station, and to take a bulk supply. Since then profits have resulted. The Ilkley District Council, who for some time have been taking a partial bulk supply from the Power Company, are now giving a trial to a complete bulk supply. The development in the West Riding has, therefore, been in a line with previous years. Supply is becoming more and more efficient, and the results more and more beneficial to the district.

In other words, the Yorkshire Company have been doing what the Government scheme proposes to do on a more elaborate scale, and with the assistance of a new body of officials. Had the Government left well alone, the electricity industry would, without doubt, have developed generally on the lines which have been pursued by this Company.

FORTHCOMING ENGAGEMENTS.

Feb. 8.—NATIONAL GAS COUNCIL.—Meeting.
Feb. 8.—FEDERATION OF GAS EMPLOYERS.—Meeting.
Feb. 9.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the showrooms of the Gas Light and Coke Company.
Feb. 10.—MIDLAND JUNIOR GAS ASSOCIATION.—Reunion and dinner at the Imperial Hotel, Birmingham.
Feb. 12.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Swansea.
Feb. 12.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Joint meeting with Eastern District at Glasgow. Paper by Mr. T. Campbell Finlayson on "The Importance of Flexibility in Gas Manufacture."
Feb. 16.—INSTITUTION OF GAS ENGINEERS AND BRITISH COMMERCIAL GAS ASSOCIATION.—Joint Conference on "The Inspection and Maintenance of Consumers' Appliances," at the Institution of Mechanical Engineers, Storey's Gate, S.W.1.
Feb. 17.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting in Birmingham. Paper by Mr. Edgar Jones, of Derby, on "Drainage and Effluents from a Gas-Works."
Feb. 19.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Leeds. Paper by Mr. T. B. Browne, of the National Gas Engine Company, Ltd.
Feb. 25.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute. Paper by Mr. E. W. L. Nicol, entitled "Coke's Case."
Feb. 26.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Visit to Messrs. Pott, Cassels, & Williamson's Works, Motherwell.
March 9.—JUNIOR GAS ASSOCIATIONS.—Education Conference.
March 16.—BRITISH COMMERCIAL GAS ASSOCIATION.—Midlands District Conference at Smethwick.
March 30.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Annual general meeting at the Hotel Cecil, Strand, W.C. 2, at 2.15.
April 8.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual spring meeting at Dumbarton.
May 5.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Spring meeting at Ipswich.
May 5.—NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—Annual meeting at Newcastle.

INSTITUTION OF GAS ENGINEERS.

Feb. 8.—Advisory Committee on Education.
Feb. 9.—Emergency Committee, Finance Committee, and Council Meeting.
June 14-17.—Annual General Meeting in London.

QUENCHING COKE WITH PRODUCER GAS.

A NEW INSTALLATION AT KIEL.

[Herr Elvers, in "Das Gas- und Wasserfach," Nov. 27, 1926.]

In 1924 the Kiel gas undertaking was faced with either the replacement or the entire renewal of a battery of regenerative coke-ovens. A tour of inspection was made of many of the Ruhr coke-works, and the simplicity of the so-called waste-heat ovens was much admired. They work without regenerator or recuperator, but they have the disadvantage—fatal, of course, for a gas supply undertaking—that they are heated with their own gas. At length a plant was inspected, erected by the firm of Collin A.G., which included a dry-quenching system, and which was giving great satisfaction. From this, the idea was conceived that it must be possible to quench the coke not, as hitherto, with inert gases, but with combustible gases, provided air is excluded; and, if the producer gas could be so employed, all necessary preheating could be achieved without either regenerator or recuperator. Calculations showed that the sensible heat of the incandescent coke would be ample for the purpose. It could also be assumed that the producer gas would receive enrichment from any part of the coke mass not completely carbonized in the ovens, from the formation, during quenching, of water gas, and from the reduction of carbon dioxide to carbon monoxide.

It was decided to erect a plant on this principle, and the contractors, Collin A.G., gave a guarantee of heat recovery from the coke, and from the other sources mentioned, of 430 calories per kilo. of coal carbonized (dry basis), which is equivalent to 775 B.Th.U. per lb. Estimates for its erection showed the cost, including dry quenching plant, to be very little above that of a normal regenerative or recuperative oven, with all the advantages which are commonly urged in favour of dry quenching. Waste heat is also available for steam raising purposes.

HEAT VALUES.

According to the makers' guarantee, per kilo. of dry coal carbonized, 1200 calories go from the producer to the coke-quenching apparatus in the form of cool producer gas at about 25° C., or 1150 cal. at 0° C. and 760° mm. [about 2070 B.Th.U. per lb. of coal]. In the quenching process, the gas assumes an addition of 430 cal. in the way of sensible heat and regeneration. Carbonization requires, per kilo. of dry coal, 360 cal., so that 1200 + 430 − 360 = 1270 cal., at 1100° C. at the oven outlet [2285 B.Th.U. per lb. coal], remain available for further use. For every 1 p.ct. of moisture in the coal up to 5 p.ct., the oven consumption is increased by 10 cal.; for from 5 to 10 p.ct. of moisture the increase is 12 cal.

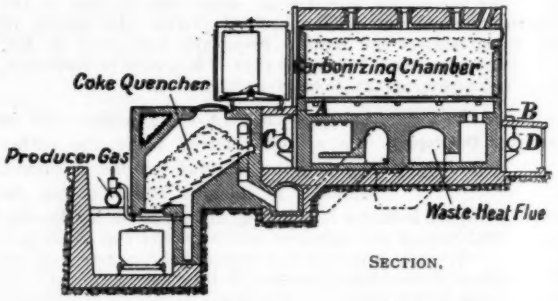
A diagram is given in the original showing the heat distribution, based upon 7 p.ct. of moisture in the coal, with a daily throughput of 230 tons of coal, and an hourly make of producer gas of $\frac{1{\cdot}44 \times 230.000}{24}$ = 13,800 cub.m. [487,000 c.ft.]. According to the diagram and estimates (figures in parentheses being per lb. of dry coal), there goes to the dry quenching plant per kilo. of dry coal 1·08 cub.m. [17·3 c.ft.] of cool producer gas having 1280 cal. [2300 B.Th.U.], which there obtains an addition of 450 cal. [810 B.Th.U.] from the various causes mentioned above. At the outlet of the quencher, there are available, therefore, 1650 cal. [2970 B.Th.U.], of which 1250 cal. [2250 B.Th.U.], contained in 0·83 cub.m. [13·3 c.ft.] of gas at 700° C., pass to the oven; and the balance, in 0·26 cub.m. [4·2 c.ft.] of gas at 700° C., after being mixed with 0·365 cub.m. [5·8 c.ft.] of cold gas, are passed direct to the waste-heat boiler. There are required in the oven, per kilo. of coal with 7 p.ct. moisture, 525 cal. [945 B.Th.U.], so that at the oven outlet there is 1·78 cub.m. [25·5 c.ft.] of waste gas at 1100° C. containing 725 cal. [1305 B.Th.U.] available for steam raising.

CONSTRUCTIONAL DETAIL.

The lay-out of the system is shown in the illustrations. One coke quenching container is provided for every three chambers, of such a size as to take the charge from one chamber. The cooling operation takes six hours, and as at the most one of the three is discharged every eight hours, the distribution is ample. The container, when filled with coke, is sealed, and the producer gas is admitted. It passes through the coke mass, and is withdrawn at the top of the container, being thereafter distributed as already described. The gas is passed through the quencher only so long as is necessary for the cooling of the coke. Thereafter, gas inlet and outlet are closed. As ovens are constantly being discharged, there are always several quenching chambers available for heating the producer gas, so that the supply for the boiler and the settings is constant in quantity and in temperature. Should any quenching chamber be temporarily out of action, the coke from the corresponding ovens can be taken to a reserve quencher which is provided at the end of the settings.

STEAM PRODUCTION AND PRODUCER PLANT.

The steam raising plant, supplied by the M.A.N. Company, consists in a double inclined tube boiler, of 700 sq.m. [7532 sq.ft.] heating surface, with superheater and preheater. It is designed normally to use 17,100 cub.m. [604,000 c.ft.] of waste gas per hour, at a temperature of 1025° C. or more, and to burn 6000 cub.m. [212,000 c.ft.] of producer gas of 250° C. and calorific value 1185 cal. [133 B.Th.U.]. According to the makers' guarantee, this is to produce steam at 20 atmos. [285 lbs. per sq. in.] and 390° C. superheat, with a consumption of 718 cal. per kilo. [1300 B.Th.U. per lb.]. The conversion of available heat into steam is 81 p.ct., not including power consumption for induced draught. This is normal capacity; maximum capacity, using additional quantities of cold producer gas, is 20,500 kilos. [about 20·5 tons] of steam, with an efficiency of 78 p.ct. This, however, is not included in the guarantee.



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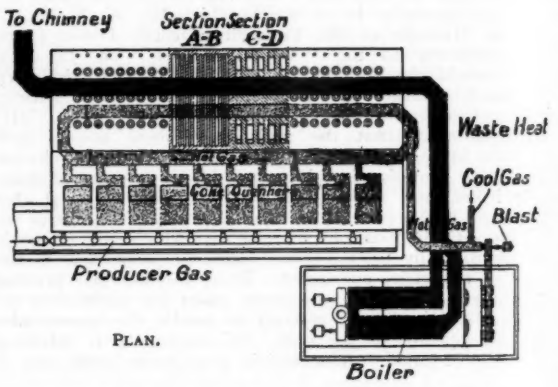

PLAN.

Waste-Heat Ovens, with Dry Quenching by Producer Gas.

The boiler is so arranged that each half can be worked with either waste gas or fresh gas, so that the waste gases from the settings can be used for steam production even when one-half of the boiler is out of action for cleaning or repairs. The steam is all consumed by the electricity works, which are situated next to the gas-works, and are under the same management.

A feature of the scheme is the central producer plant, supplied by the firm of Thyssen. It is of the revolving grate type, and is a complete unit of four producers, of a capacity of 20 tons of coke each per 24 hours. The gas production from coke of 6500 cal. [11,700 B.Th.U. per lb.] is reckoned at 4·425 cub.m. per kilo. [70·89 c.ft. per lb.], of calorific value 1130 cal. [127 B.Th.U.].

GENERAL CONSIDERATIONS.

The article concludes with the estimates of capital and working costs which decided the adoption of this system, in preference to rebuilding the old ovens or erecting new regenerative ovens on the usual principle. A conservative reckoning shows that the extra capital cost should be easily recovered within a year. The plant had, at the time of writing, only been in operation about a month, so that working results were not yet available. As far as could be seen, however, guaranteed figures were being reached.

GAS LIGHT AND COKE COMPANY.

Annual Report and Accounts.

The following is the report of the Directors of the Company for the year ended Dec. 31, which will be presented at the ordinary general meeting on Friday next.

The accounts for the year show that, after paying in respect of the June half-year dividends at the rate of 4 p.ct. per annum on the 4 p.ct. preference stock, 3½ p.ct. per annum on the 3½ p.ct. maximum stock, and £5 1s. 4d. p.ct. per annum on the ordinary stock, and after contributing the sum of £20,000 to the redemption fund, there is a total available balance of £676,973 15s. 7d., out of which the Directors recommend the payment of the following dividends in respect of the December half-year: On the 4 p.ct. preference stock, at the rate of 4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of 3½ p.ct. per annum; and on the ordinary stock, at the rate of 5 p.ct. per annum, which, together with the further sum of £15,000 to be contributed to the redemption fund, will absorb £612,326 18s., and will leave £64,646 17s. 7d. to be carried forward to the credit of the current year.

The transfer to the Company of the undertaking of the late Brentford Gas Company took effect on Jan. 1, 1926.

The sale of gas during the past year shows an increase of nearly 2½ p.ct. There has been an addition for the year to the number of the Company's consumers of 24,699, and an increase of 112,732 in the number of gas stoves sold and let out on hire.

The Board of Trade held a public inquiry on March 8 into the Company's application for a revision of their standard price under section 1 of the Gas Regulation Act, 1920, and issued an Order, dated June 2, 1926, increasing the Company's standard price from 11d. to 11·4d. per therm.

A Bill in Parliament conferring, among other matters, additional borrowing powers upon the Company passed through all its stages, and received the Royal Assent on Aug. 4.

The Directors are pleased to report that neither the pressure nor the calorific value of the gas was interfered with during the period of the coal stoppage.

The price of gas for the first three quarters of the year remained at 9·4d. per therm. In view, however, of the very large extra expenditure on foreign coal, caused by the coal stoppage, the Directors were compelled to advance the price to 9·6d. per therm as from the reading of the meter indices for the September quarter, to 10·6d. per therm as from a special reading of the meter indices in October, and again to 11·6d. per therm as from the reading of the meter indices for the December quarter. The Directors have since decided to reduce the price of gas by 1·4d. per therm, to take effect as from the reading of the meter indices for the March quarter, 1927.

The Company were honoured by a visit paid by Their Majesties the King and Queen to the Company's Beckton Works, on July 10, to inaugurate the new coal handling plant, and by H.R.H. the Duchess of York, to Church Street, Kensington, on Oct. 19, to open the new showrooms.

The Company were also favoured by a visit of the President of the Board of Trade, the Right Hon. Sir Philip Cunliffe-Lister, M.P., and Lady Cunliffe-Lister, to start the new coal handling plant at the Fulham Works, and of the Chairman of the London County Council, Sir George Hume, M.P., to open the new training centre at Imperial Wharf, Battersea, which has been re-named "Watson House."

The Directors accepted with great regret the resignation of Mr. J. Lister Godlee in October. Mr. Godlee had been a Director for over seventeen years, for four of which he held the post of Deputy-Governor. Mr. Henry Woodall was elected Deputy-Governor in his place.

DAVID MILNE-WATSON,
Governor.

Horseferry Road, Westminster, S.W. 1,
Jan. 27, 1927.

The Accounts.

The following are the main features of the accounts for the year:

The statement of capital (stocks) sets forth that the total paid-up is £11,575,066; added on conversion, £14,424,874—total £25,999,940. Deducting the amount redeemed, £495,460, the total amount of the Company's existing capital powers is £25,504,480.

The statement of loan capital stands thus: Total paid-up, £5,667,792; added on conversion, £2,124,983; remaining unissued, £4,980,215—total amount authorized, £12,772,990.

CAPITAL ACCOUNT.

The capital account shows the following expenditure:

Expenditure.

	Expended this Year.	Total to Dec. 31, 1926.
Expenditure to Dec. 31, 1925—		
Gas Light and Coke Company		£16,444,986 0 2
Brentford Gas Company		2,653,331 18 8
		£19,098,317 18 10
Expenditure during the year to Dec. 31, 1926—		
Lands acquired, including law charges	£31,076 12 5	
Buildings and machinery in extension of works	89,058 15 1	
New and additional mains and service-pipes	239,275 9 1	
Do. do. meters	32,924 8 3	
Do. do. stoves	263,441 13 6	
	655,776 18 4	
	£19,754,094 17 2	
By amount written off plant	£15,252 0 0	
,, depreciation of stoves	69,719 0 0	
	84,971 0 0	
Total expenditure	£19,669,123 17 2	
Nominal amount added on conversion	16,549,857 0 0	
	£36,218,980 17 2	
Deduct amount of capital redeemed under the Gas Light and Coke Company's Act, 1903—		
Per previous account	£453,960 0 0	
This year	41,500 0 0	
	495,460 0 0	
	£35,723,520 17 2	

REVENUE ACCOUNT.

Revenue.

Year, 1925.		£ s. d.	£ s. d.
	Sale of gas—		
£7,875,276	Per meter at 9·4d., 9·6d., and 10·6d. per therm*	8,691,488 15 10	
236,825	Public lighting and under contracts	238,815 12 10	
8,112,101			8,930,304 8 8
259,394	Rental of meters	..	290,296 2 1
374,383	Rental of stoves	..	432,208 18 6
490,642	Rental of fittings	..	488,501 1 8
	Residual products—		
1,458,030	Coke, less labour, &c.	1,704,347 4 6	
116,790	Breeze, less ,, ,,	161,373 10 4	
328,208	Tar and tar products	436,627 10 4	
106,876	Ammoniacal liquor and sulphate of ammonia	79,003 2 9	
2,009,904			2,381,351 7 11
24,242	Rents receivable		25,246 16 0
685	Transfer fees		630 5 6
11,271,351			£12,548,619 0 4

* These prices were higher in the Brentford and Richmond areas respectively by the amounts per therm authorized by the Gas Light and Coke Company's Act, 1925.

Expenditure.

Year, 1925.		£ s. d.	£ s. d.
	Manufacture of gas—		
£3,514,052	Coal, including all expenses thereon	3,923,981 2 3	
404,365	Oil ,, ,, less value of oil tar	523,767 0 5	
336,107	Coke, &c., used in the manufacture of carburetted, &c., water gas	606,316 2 10	
111,259	Salaries of engineers and other officers at works	120,846 10 11	
461,599	Wages	424,788 3 9	
48,716	Purification	50,320 13 2	
1,510,879	Repair and maintenance of works and plant, materials and labour, less received for old materials, £14,853 14s.	1,834,576 19 3	
6,387,377			7,484,596 12 7
	Distribution of gas—		
446,743	Salaries and wages (including rental clerks) and cost of pumping gas	489,922 16 10	
588,685	Repair and maintenance of mains and service-pipes, &c.	643,078 8 7	
309,784	Repair and renewal of meters	327,783 11 3	
537,704	,, ,, stoves	666,836 15 9	
63,920	Fitting up automatic meter supplies	103,055 17 4	
1,946,636			2,265,677 9 9
110,711	Public lamps—lighting and repairing	..	111,800 10 9
	Rents, rates, and taxes—		
19,970	Rents payable	22,289 7 10	
616,523	Rates and taxes	548,190 18 9	
636,493			570,480 6 7
	Management—		
14,500	Directors' allowance	12,500 0 0	
915	Company's Auditors	800 0 0	
60,361	Salaries of management staff	68,729 11 11	
164,097	Collectors and cashiers	174,329 1 5	
42,021	Stationery and printing	50,604 18 5	
55,145	General charges	75,328 8 5	
337,539			382,292 0 2
73,462	Co-partnership	..	84,454 13 8
5,315	Parliamentary charges	..	6,463 5 0
2,269	Law charges	..	2,320 16 2
2,611	Rating charges	..	522 12 1
8,352	Bad debts	..	8,971 0 4
1,000	Depreciation fund for works on leasehold lands	..	1,000 0 0
134,616	Annuities and contributions to superannuation funds	..	152,912 9 3
8,421	Workmen's compensation	..	7,838 10 11
53,445	Company's contribution under National Insurance Acts	..	63,373 19 6
*45,535	Expenses re Brentford amalgamation	..	63,994 17 0
3,112	Public officers, &c.— Contribution under Gas Regulation Act, 1920, and Official Auditor	2,824 5 0	
1,422	Public testing-stations	1,249 3 2	
9,761,316			11,210,772 11 11
1,510,035	Balance carried to net revenue account		1,337,846 8 5
11,271,351			£12,548,619 0 4

Total Wages Paid, 1926, £2,904,540. Total Salaries Paid, 1926, £665,194.

* Harrow and Richmond.

NET REVENUE ACCOUNT.

The total of the net revenue account is £1,485,642. The following statement shows how it is appropriated:

Year 1925.			
£216,761	..	Interest on debenture stocks and mortgage bonds for the year	£243,793 9 1
179,223	..	Interest on temporary loans and sundry funds, less credits	134,915 13 11
		Dividends, &c., for the half-year to June 30, 1926: Dividend on the 4 p.ct. consolidated preference stock, £83,140 8s.	
83,145	..		
45,500	..	Dividend on the 3½ p.ct. maximum stock, £45,500	
20,000	..	Contribution to redemption fund, £20,000	
Gas Light £5 6s. 8d. p.ct. 438,935		Dividend on the ordinary stock (£5 1s. 4d. p.ct. per annum), £475,986 19s. 9d.	
Brentford 60,592			
648,172			624,627 7 9
841,630	..	Balance applicable to redemption fund and to dividends, December half-year, 1926	676,973 15 7
£1,825,786			£1,680,310 6 4

Proposed Appropriation of Balance on Net Revenue Account, Dec. 31, 1926.

Year 1925.		£ s. d.	£ s. d.
£841,630	Balance	..	676,973 15 7
	Amount required for dividends, &c., for the half-year to Dec. 31, 1926: Dividend on the 4 p.ct. consolidated preference stock	83,140 8 0	
£83,145			
	Dividend on the 3½ p.ct. maximum stock	45,500 0 0	
45,500			
15,000	Contribution to redemption fund	15,000 0 0	
Gas Light £4 17s. 4d. p.ct. £399,390	Dividend on the ordinary stock, £5 p.ct. per annum on £18,747,460	468,686 10 0	
Brentford £56,131			
£599,166			612,326 18 0
£242,464	Balance carried to next year's account	..	£64,646 17 7

Statement of Coal.

—	In Store Dec. 31, 1925.	Received during Year.	Carbonized during Year.	Used during Year.	In Store Dec. 31, 1926.
	Tons.	Tons.	Tons.	Tons.	Tons.
Coal	318,461	2,093,432	2,180,461*	3679	227,753

* In addition to this quantity of coal, 31,019,589 gallons of oil have been used during the year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1925.	Made during Year.	Used during Year.	Sold during Year.	In Store Dec. 31, 1926.
Coke—tons	55,571	1,374,483	268,266	1,129,347	32,441
Breeze—tons	8,447	260,233	34,362	222,275	12,043
Tar, from coal only—galls.	2,341,993	21,177,720	19,836,641	1,103,739	2,579,333
Ammoniacal liquor—butts	44,038	673,927	676,702	..	41,263

The four statements relating to the redemption, reserve, special purposes, and depreciation funds stood as follows on Dec. 31: Redemption fund, £20,000; reserve fund, £142,124; special purposes fund, £530,203; depreciation fund, £101,517.

The remaining statement is the balance-sheet, which gives the value of the stores on hand at the close of the year as follows: Coal, £600,224; gas oil, £110,332; coke, £40,551; tar and ammoniacal liquor and products, £200,885; and sundry stores £1,073,891. The figures at the end of 1925 were: Coal, £433,254; gas oil, £115,618; coke, £42,484; tar and ammoniacal liquor and products, £157,373; and sundry stores, £918,165.

Statement of Gas Made, Sold, &c.

		Quantity Made.	Quantity Sold.			Quantity Used on Works, &c.	Total Quantity Accounted for.	Quantity Not Accounted for.	Number of Public Lamps.
			Public Lights and Under Contracts (Estimated).	Private Lights (per Meter).	Total Quantity Sold.				
1926.	Cubic feet (thousands)	47,429,073†	816,323	44,228,163	45,044,486	560,796	45,605,282	1,823,791	47,731
	Therms §	237,922,825	4,095,345	221,866,338	225,961,683 *(225,222,430)	2,813,257	228,774,940	9,147,885	
1925.	Cubic feet (thousands)	47,009,670	946,245	43,085,394	44,031,639	665,643	44,697,282	2,312,388	49,844
	Therms	236,173,830	4,753,997	216,457,990	221,211,987	3,343,895	224,555,882	11,617,948	

* At declared calorific value—viz., 500 B.Th.U. per cubic foot.
† Including 19,066,316 thousands of carburetted, &c., water gas.
§ At actual calorific value—viz., 502 B.Th.U. per cubic foot.

CARBONIZING PLANT AT FOOTSCRAY.

Glover-West Vertical Retorts.

In connection with the first annual convention of the Australian Gas Institute, an account was given in the "JOURNAL" for the 12th inst. of the reconstruction of the Footscray Works of the Colonial Gas Association, Ltd. This information we are now able to supplement with the following particulars taken from the January issue of "West's Gas."

West's Gas Improvement Company, Ltd., were entrusted with the contract for a vertical retort installation designed to supply the demand for gas in the cities of Footscray and Williamstown and the Shire of Braybrook. The work of reconstruction included: Railway siding into works, coal store and grabbing pits, mechanical overhead transporter and grab, carbonizing plant, coal and coke handling plant, engine and boiler house, boilers, condensers, purifiers, overhead foul mains, and a 500,000 c.ft. two-lift gasholder. The foundations for the new carbonizing plant were completed in October, 1925, and the plant was put into gas-making commission on June 7, 1926.

The carbonizing plant consists of 24 New Model Glover-West vertical retorts 33 in. by 10 in. at the top, by 25 ft. long, arranged in units of four, with a further setting shell consisting of front and back walls and girder floor to accommodate eight additional retorts. The retort bench is encircled by one line of 70 ton per hour lip-bucket conveyor, with provision for duplication when required. The conveyor passes outside the building at charging platform level, and delivers the coke from the retort discharge to the coke screens and storage hoppers. The coal, after passing through the breaker, is fed to a fixed bucket elevator which delivers it to the top strand of the lip-bucket conveyor. From this point it is taken up to the coal-storage bunkers over the retort-bench, where 48 hours' supply is carried.

It was found necessary to provide direct railway connection with the main line, and loops were provided to handle coal into the works and coke and other products out. The railway wagons run over the breaker-pit hopper, into which coal is discharged, coal for storage being handled direct by the transporter grab. The coal store, which is of the open type, is in reinforced concrete, 210 ft. long by 72 ft. wide, with a high retaining wall on one side, which gives a capacity of 7000 tons.

The transporter track is carried on the coal store walls; the transporter enabling coal to be delivered or reclaimed from any part of the store desired. The transporter is designed for a maximum load of tons, and is capable of handling, with the grab, 35 tons of coal per hour. The two grabbing pits are 26 ft. deep, and have a capacity of 75 tons each.

As previously mentioned, gas making was commenced in the new vertical plant on June 7, 1926, and on June 10 both the Footscray and Williamstown old plants were permanently closed-down; the whole of the gas being now supplied from one station.

The results obtained to date have been very satisfactory; the average yield for the month of August being 101 therms per ton of 512 B.Th.U. gross. The thermal yield for September reached as high as 108, with a calorific value of 509 B.Th.U. gross; the amount of steam used in the retorts averaging approximately 22 p.ct.

FUEL RELATIVITIES.

POWDERED AND SOLID FUELS.

By HARALD NIELSEN, of Sensible Heat Distillation, Ltd.

Industrialists and engineers are often called upon to make a decision as to the relative value of one fuel as against another from the efficiency point of view. There are, of course, two outstanding features at once apparent—namely, ash and moisture contents. If the relative difference is considerable, the question is comparatively easily answered; but when the figures more closely coincide, the matter is certainly not nearly as simple. Knowing the analysis fairly completely, it should be possible from ascertainable facts to form a judgment which would stand in actual practice.

The well-worn Dulong formula for ascertaining the calorific value of fuels: $81 \times C + 290 \times \left(H - \frac{O}{8}\right) + 25S - 6\,H_2O$ = cal. val. in kg. cal. per kg. was early made use of.

GERMAN PRACTICE.

Twelve to thirteen years ago, Dr. Aufhauser attempted to classify fuels—gaseous, liquid, and solid—and to attach to the various substances an "equivalent value coefficient" deducted from the Dulong formula, and which should be characteristic of one particular material in relation to another. This worker, therefore, suggests that the expression $\left(H - \frac{O}{8}\right) : \frac{C}{12}$ (see de Grahl—Wirtschaftliche Verwertung der Brennstoffe) should form a convenient means of doing so. The lower the numerical value of the coefficient, the less valuable or useful would the material therefore be.

Table I. gives some of the values which according to Aufhauser's theory must be allotted to fuels of different descriptions. Some of the figures are given by de Grahl.

TABLE I.

Fuel.	P.Ct. Ultimate Composition.		Equivalent Value Coefficient. $\left(H - \frac{O}{8}\right) : \frac{C}{12}$.
	Carbon P.Ct.	"Free" Hydrogen $\left(H - \frac{O}{8}\right)$.	
Town gas	20·00	4·30	2·60
Petrol	85·00	15·00	2·12
California crude	83·60	11·50	1 65
"L & N" L.T. crude	88·53	8·16	1·17
Benzole	92·30	7·70	1·00
H.T. retort tar	88·00	6·40	0·87
Long-flame bituminous coals	85·00	4·30	0 60
Short-flame bituminous coals	88·00	4·10	0·56
Brown coal	64·00	2·20	0·41
Peat	62·00	2·00	0·38
Anthracite	94·00	2·60	0 33
Wood	50·00	0·50	0·12
H.T. coke	86·00	0·00	0·00

It would seem from the above that the most active and highest value fuel is gas, followed by petroleum oils, L.T. oils, benzole, &c., right down to anthracite and H.T. coke. The writer cannot help but feel that Aufhauser's method is rather fallacious. Why brown coal and peat should have an equivalent coefficient higher than anthracite and H.T. coke, is not at all clear. All practical experiences go very much to the contrary; and unless equivalents can be substantiated by general practice, and unless they take into account a great many more details, we are not much better off. The "equivalent values" are certainly not so easy to ascertain.

Light-heartedly the writer commenced to work out the problem, treating particularly the oil relativities (which were first considered and published in the "Fuel Economist," October, 1926) almost as a joke, as the figures indicated that H.T. tar was very much superior to Pennsylvanian crude oil. Now, however, he can truthfully say (with the Western judge, when he hung the wrong man) "the joke is on me!" The work entailed was far greater than was first contemplated; but it was worth it, as it does seem that, proceeding along certain lines, specific equivalent figures can be obtained which agree with practice, and do not include any doubtful elements, as far as present knowledge goes.

SUGGESTED NEW METHOD.

As a base for calculations, we start with the following factors which can be ascertained accurately within a close margin—namely, the ultimate analysis on a dry basis, the calorific value, and, if desired, also the apparent specific gravity, or, rather, weight per unit volume in powdered form.

It is now possible to work out the theoretical amounts of air, weight of combustion products, &c., required or produced per unit weight of fuel burnt. From these data it is also comparatively simple to find the mean specific heat of the combustion products at higher temperatures. There seems, however, to be some slight discrepancy between the specific heat values found by various modern investigators. Holborn and Henning's figures agree closely with Piers. Recently Dr. W. G. Shilling, in the Faraday Society's "Transactions," Vol. XXII., part 6, reviewed the present-day knowledge, and gave a set of figures which are slightly higher than Holborn and Henning's. But for our purpose in view, since the comparisons are all brought down to the same basis, the slight errors possibly incurred in using Holborn and Henning's data may be neglected (see fig. 1).

The following is the basis on which the figures in Table II. have been computed; taking quantities on a weight basis, in order to facilitate matters:

CO_2 = weight of carbon × 3·666.
O_2 = " " " × 2 666.
Air = " " " × 11·55.
N_2 + argon = weight of air × 0·769.
Air to O_2 = " " " × 0·231.
Air = 1·294 kg. per cub. metre.

Specific heat of gases at 2000° C. (Holborn and Henning)
CO_2 $0·201 + 0·000,0742t + 0·000,000,018t^2 = 0·2774$.
N_2 $0·235 + 0·000,019t = 0·2730$.
H_2O $0·467 - 0·000,0168t + 0·000,000,044t^2 = 0·6091$.

The flame radiation is, according to Stephan-Boltzmann, a function of the difference of the fourth power of the absolute temperature differences, Tab^4—tab^4.

For any shortcomings in the fourth decimals in the figures stated in Table II., the writer wishes to apologise, as an ordinary 10-in. slide-rule cannot, unfortunately, be relied upon to give results accurate to more than three decimals.

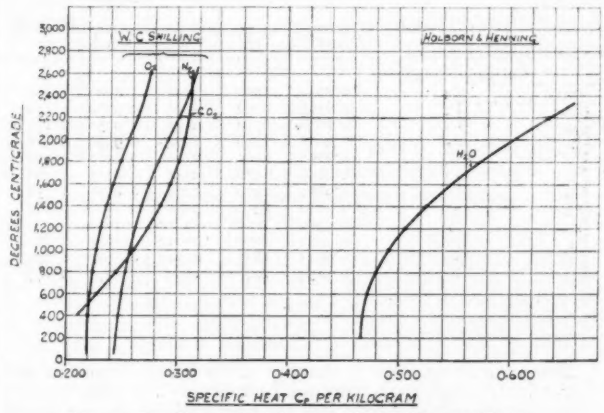

Fig. 1.—Specific Heat of Gases at Higher Temperatures.

Very few explanations are necessary in order to understand Table II. It must, however, be remarked that the figures in column 25 are based on volumetric tests on powdered fuels all passing through a 100-mesh sieve. On all occasions it was noted that the volumes occupied by relatively powdered raw coals, as well as those of semi-cokes, or rather "L & N" fuels, were the same within the usual experimental errors.

A method of letter and number identification has been employed to facilitate specific references to any particular figure.

EFFICIENCY OF HIGH CARBON FUELS.

As standard for comparisons pure carbon is employed; and it will be seen that the closer the fuel approaches pure carbon in composition, to use a perhaps somewhat misleading term—or, in other words, the lower the volatile content of the fuel—the more theoretically efficient the fuel is. Hence a low-volatile coke like H.T. gas-works coke or metallurgical coke comes as near to the ideal—namely, pure carbon—as possible. So would anthracite; but here we are up against the usual practical difficulties as regards the combustion of such material. High-temperature coke is covered with a graphitic carbon film which is not very reactive or easily combustible, unless the coke is extremely finely pulverized, or forced draught is employed, as well as high temperatures. Given these conditions, H.T. coke is ideal. The theoretical flame temperature is high, the flame radiation is high, and the mean specific heat of the combustion products is low. Further, the apparent specific weight in powdered form is relatively high. Hence more heat energy per unit volume in powdered form can be carried than, for example, by a non-coking high-volatile raw coal, or, for that matter, by any raw coals except anthracite.

It is, therefore, evident that the reasons why "Sandwich" firing is so eminently successful are the above facts. The admixture of H.T. coke with raw coal produces combustion products with a lower specific heat, higher flame temperature, greater radiative effects, and hence an all-round higher efficiency.

TABLE II.

Index Letter.	Raw Coals and Distilled Residue.	P.Ct. Carbon.	P.Ct. Hydrogen.	P.Ct. Oxygen.	P.Ct. Ash.	C/H Ratio.	Calorific Value Kg. Cal. per Kg.	Weight of Air for Combustion of 1 Kg. Fuel.			Combustion Products per 1 Kg. Fuel Burnt.				Weight of Total Comb. Products.
								C to CO_2.	H_2 to H_2O.	Total Air.	Kg. CO_2.	Kg. H_2O.	Kg. N_2.	H_2O from O_2 in Fuel.	
—	Column No. 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
A_1	Pure carbon	100 p.ct.	0·00	0·00	0·00	∞	8100	11·550	0·000	11·550	3·666	0·000	8·880	0·000	12·550
B_1	Low vol. coke, H.T.	85·20	0·55	1·65	12·0	155·0	7010	9·85	0·139	9·989	3·130	0·036	7 685	0·018	10·869
C_1	Coking coal	77·21	4·71	5·89	8·3	16·40	7400	8·90	1·373	10 273	2·830	0 367	7 900	0·0664	11 1634
D_1	"L & N" fuel from coking coal	81·66	2 80	3·61	11·1	29·20	7300	9·425	0·815	10·245	2·990	0·2115	7·875	0·0405	11·115
E_1	Medium coking coal	65·22	4 63	9·40	19·5	14·20	6280	7·535	1·201	8·736	2·390	0·311	6·720	0·1057	9·5267
F_1	"L & N" fuel from medium coking coal.	63·94	2·02	8·04	23·9	31·70	5490	7·390	0·353	7·743	2·342	0·c918	5·950	0·c900	8·474
G_1	Non-coking coal	75 69	5·04	13·84	3·4	15·05	7090	8·750	1·142	9·892	2·770	0·297	7·600	0·1560	10·823
H_1	"L & N" fuel from non-coking coal	83·14	3·27	7·00	5·5	25·45	7410	9·600	0·827	10·427	3·050	0·2150	8·020	0·0788	11·364
I_1	Australian dry brown coal	61·50	4·40	31·01	2·6	14·0	5300	7·120	0·184	7·304	2·260	0·0477	5·600	0·348	8·256
J_1	Australian brown coal, 15 p.ct. H_2O	52·30	3·74	26·40	..	14·0	4400	6·050	0·153	6·203	1·920	0·0396	4·760	0·296 0 150	7·165
K_1	Australian brown coal, 40 p.ct. H_2O	36·90	2·64	18 60	..	14·0	3090	4·27	0·112	4·382	1·358	0·0286	3·360	0·209 0·400	5·355
L_1	"L & N" fuel from Australian brown coal	74·50	3·18	15·50	5·1	23·4	6400	8·64	0·410	9·050	2·735	0·106	6·945	0·175	9·961

Index Letter.	—	Mean Specific Heat of Comb. Products. 2000° C.	Theoretical Flame Temperature °C.	Flame Temperature Corrected for Ash Contents.	Relative Flame Radiation Efficiency Corrected.	Relative Weight of Fuel Burnt for Equal Air Volume.	Corresponding Heat Units Evolved Kg. Cal.	Relative Heat Losses in Flue Gases for Equal Heat Evolved	Percentage of Total Heat Loss in Flue Gases for Even Heat Evolved	Theoretical CO_2 P.Ct. by Weight in Flue Gases (250° C.)	Average Volume of 1 Ton of Powdered Fuel in C.Ft.	Relative Net Heat Carried in Even Bulk as Powdered Fuel.	Relative Heat Energy Carried in Even Bulk against P.O.	Remarks.
—	—	16	17	18	19	20	21	22	23	24	25	26	27	
	Corresponding to—													All fuels are on dry basis except when otherwise stated. Column 27 represents the corresponding heat energy of the fuel for equal bulk of Pennsylvanian crude oil (P.O.) having a net value = 10,380 kg. cal. per kg. and specific gravity = 0·86, water = 1.
A_{11}	A_1	0·2744	2350	2350	1·000	1·000	8100	1·000	10·64	29·22	40·0	1·000	..	
B_{11}	B_1	0·2763	2350	2320	0·9860	1·156	8210	1·000	10·61	28·82	40·0	0·866	0 688	
C_{11}	C_1	0·2870	2310	2290	0·9050	1·125	8320	1·015	10·82	25·40	50·8	0·710	0·5740	
D_{11}	D_1	0·2813	2340	2320	0 9;00	1·128	8240	1·006	10·70	26·90	48·2	0·743	0·5950	
E_{11}	E_1	0·2892	2285	2240	0 8260	1·326	8340	1·035	10 80	25·10	50·8	0·601	0·484	
F_{11}	F_1	0·2814	2310	2245	0·8425	1·482	8150	1·018	10·80	27·70	48·2	0·562	0·448	
G_{11}	G_1	0·2885	2270	2260	0 8525	1·158	8200	1·038	11·05	25·60	50·8	0·676	0·550	
H_{11}	H_1	0·2822	2310	2300	0 9200	1·105	8200	1·006	10·70	26·90	48 2	0·755	0·605	
I_{11}	I_1	0·2904	2210	ash too	0·7860	1·571	8325	1·069	10·95	27·40	..	..	..	
J_{11}	J_1	0·2972	2070	low to	0·6060	1·862	8200	1·134	11·34	26·78	77·0	0·249	0·225	
K_{11}	K_1	0·3144	1835	influ-	0.3720	2·635	8140	1·285	12·13	25·30	..	..	..	
L_{11}	L_1	0·2834	2240	ence	0 8275	1·275	8160	1·045	10·90	27·50	68·5	0·436	0·367	

Before oil firing came to the fore in the Navy, anthracite and low-volatile steam coals were used for exactly the same reasons —higher general efficiency and the possibility of greater steam generation per unit of heating surface, due to a larger percentage of the total heat evolved being available as radiant heat. We shall, later on, go somewhat closer into the relative values of radiant heat *versus* conducted heat for steam generation.

Tests on a large scale with powdered semi-coke of the "L & N" type have also shown that the steaming conditions are better with this fuel, having a lower volatile percentage, than with raw coal.

It will therefore be seen that the final comparative values given in column 26 are more in accordance with actual practice and ascertained facts than are Aufhauser's (Table I.).

The ideal fuel for steam raising or heating purposes is generally, therefore, a low-volatile, highly reactive, easily combustible fuel, free from graphitic carbon, as naturally ash-free and as dry as possible. Within reason, however, the actual free moisture content (say, up to 5 p.ct.) does not play quite the important part one would imagine at first glance, since the amount of H_2O produced by the combustion of a relatively high oxygen coal—for instance, a bituminous non-coking coal (G_1)—is about three times that found in the combustion products due to the free moisture contents of the coal.

When combusting the distilled residue against the original raw coal, the figures relating to (for exatmple) E_1 and F_1, G_1 and H_1, and more particularly I_1 and L_1 are highly instructive, showing the differences in efficiency very clearly.

All efforts must therefore be concentrated on producing such fuels. We simply cannot afford to waste any heat units; we must strive to obtain them in a form which will produce most energy for us. A high calorific value fuel does not necessarily mean a fuel which can be burnt more efficiently than another of a somewhat lower calorific value—take, for instance, G_1 and D_1.

NEW SCOPE FOR GAS COMPANIES.

Here is a chance for the gas-works to convert their "theoretical" highly efficient coke into a general all-round efficient fuel. The main difficulty here, however, is the graphitic carbon. It may in all probability mean that present-day gas practice will have to be altered. Certain lines are indicated above.

Take the mighty energy-producing stations, such as those at Beckton and East Greenwich. Provided the coke produced could be burnt practically as a powdered fuel, they would represent by far the biggest and most efficient super power stations in the world—larger than all the water power stations combined.

Well, the gas engineer will say: "My business is to make gas first and foremost; and all other considerations are secondary to that one." But this is fallacious, for gas can be made in large quantities without spoiling the valuable properties of the resultant low-volatile coke. Gas to the amount of 12,000 to 13,000 c.ft. of 450 to 500 B.Th.U. can be produced per ton of gas coal, reducing the volatile matter in the resulting fuel down to 2 to 3 p.ct. The cracking of the oil and tarry vapours can be done extraneous to the incandescent coke, in order to make up to the large gas volume required. Further, by effecting the flow of heat in uniflow with the flow of gases evolved, the methane and other gases producing hard graphite are not cracked-up. Why, therefore, use the incandescent coke in the retorts as the cracking surfaces, and thereby render the coke more or less useless for our purpose?

Why should not the gas engineer be the producer of the best and most efficient all-round solid fuel at the same time as he produces the gas. One day—perhaps in the not distant future —he will certainly do so, and thereby become a universal supplier of industrial and domestic solid fuel.

Fig. 2 indicates the variations in the theoretical flame temperature. Curve C.F.E.A. shows how flame temperature varies with different percentages of excess air. Curve C.C.P.W.E.A. indicates the weight of the total combustion products in grammes per 1000 grammes of carbon combusted with different percentages of excess air.

Fig. 3 indicates the flame temperatures of carbon with the theoretical air supply; the carbon being associated with moisture in various percentages (curve C.F.). Curve C.S. shows the variation in the specific heat of the flue gases. The other two curves (M.F. and M.S.) are relatively the same, but for Australian brown coal. The two sets of curves represent extremes. Consequently other fuels, with the exception of wood and peat, will have intermediate values.

We know that there are many other factors influencing the

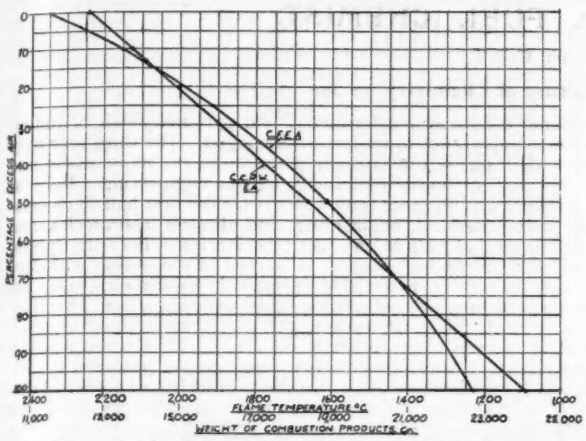

Fig. 2.—Combustion of Carbon with Excess Air | Per Kg. of Weight of Combustion Products | Carbon.

flame temperature; but our ideas are somewhat hazy when it comes to very high temperatures. We know that CO_2 is dissociated—$2CO_2 \rightleftharpoons 2CO + O_2$. Langmuir and Bjerrum have done some work in this direction; and their results are in good agreement. In fig. 4 their respective curves are plotted; but from column 17, Table II., it will be seen that, when considering the various fuels on a dry basis, the differences in theoretical flame temperatures, though considerable from a radiation point of view, are not so great as to cause any perceptible error in the CO_2 dissociation percentage. Hence it may be taken that the dissociation is, within 1 to 2 p.ct., the same in each case. Furthermore, we do not know the mechanism of the $C\text{-}O_2\text{-}H_2$ complexes at high temperatures. In fact, we are sadly uninformed as to the fundamentals of combustion, though we know the ultimate results. Nevertheless, in the writer's opinion, this ignorance does not necessarily detract from the possibility of assessing the comparative value of various solid

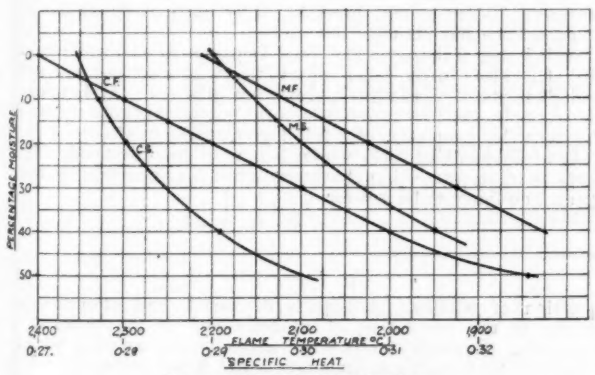

Fig. 3.—Theoretical Combustion.
Flame Temperatures for Varying H_2O Percentages.
Specific Heat of Combustion Gases for Varying H_2O Percentages.

fuels on the outlines suggested above, particularly as actual practice supports the contention.

New Possibilities in Steam Generation.

Reference has been made to the immense value of radiated heat for steam raising. De Grahl mentions Prof. Constam's report in "Z.d.V.d.I.," 1909, on a test of four months' duration on a "Garbe" boiler. This type of boiler has two horizontal drums connected with straight tubes, slightly inclined forwards towards the vertical.

The boiler in question had a total heating surface of 2500 sq.ft. The first row of tubes, of a heating surface of 100 sq.ft., was subjected to intense radiation; and about 40 p.ct. of the whole steam was generated in these tubes—or 4 p.ct. of the heating surface generated 40 p.ct. of the steam. Analyzing this quantity of steam, Prof. Constam found that 7 p.ct. was generated by conduction, while the balance, 33 p.ct., was generated by direct radiation. It is therefore clear that, by radiation, from four to five times as much heat can be forced through the heat-absorbing surfaces as by straightforward conduction. Hence we must attempt to convert as much heat as possible into radiant heat, provide radiant high-refractory surfaces, and

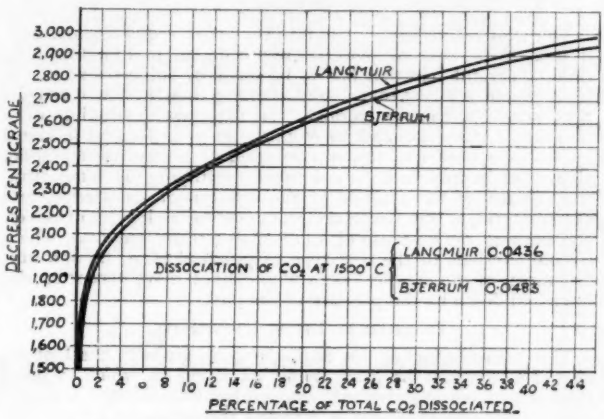

Fig. 4.—Dissociation of CO_2 at Higher Temperatures.
[$2CO + O_2 \rightleftharpoons 2CO_2$.]

design our boilers so as to take full advantage of this. It will certainly mean a radical alteration in present boiler practice; but if four or five times the quantity of steam can be generated in a boiler of the same heating surface, peak loads can be easily met. Stand-by boilers, with their inherent drawback, will be a thing of the past.

The writer can visualize the steam generator of the near future. It will simply consist of a combustion chamber with walls, provided by a few rows of radiation tubes; the heat being produced by the combustion of a powdered, low-volatile reactive fuel, from which all the original volatile matter has been previously recovered and converted into town gas or oil—as much of the heat as possible being rendered available as radiant heat. The balance will be absorbed in secondary boilers and in air-preheating reversible regenerators, so as to bring up the furnace temperature to the practical limit. Modern high refractories make this possible.

Southern District (Kent Area) Gas Salesmen's Circle.—The next meeting of this Circle will be held on Wednesday, Feb. 9, at Folkestone, when a member of Radiation, Ltd., will give a lecture entitled "Some Considerations in Domestic Heating and Cooking."

Society of Engineers.—The inaugural meeting of the Society for 1927 will take place on Monday, Feb. 7, at 5.30, in the apartments of the Geological Society, Burlington House, W., when Mr. D. C. Fidler will deliver his Presidential Address, and the retiring President (Mr. G. O. Case) will present the premiums awarded in 1926.

Impregnating Silicic Acid Gel with Carbon.—Experiments are described by Messrs. H. A. Fells and J. B. Firth, of University College, Nottingham, in the "Journal" of the Society of Chemical Industry, which had for their object to investigate the influence of uniformly distributed carbon on the sorptive capacity of silicic acid gel, with the view of producing a sorbent (for which they suggest the name "carbo-gel") which will be superior in sorptive power to silicic acid gel or active carbon, for use for the recovery of benzene and toluene. The results show that, though the sorptive capacity of carbon for benzene is relatively small, the association of a small amount of carbon with the gel gave a product of sorptive capacity greater than that of the original gel. This increase in sorptive capacity continues with increased carbon content, until the gel contains about 18 p.ct. of carbon.

North of England Gas Managers' Association.—The annual meeting of the Association, which will also be the Jubilee, will take place in the Station Hotel, Newcastle-on-Tyne, on Thursday, May 5, at 12 o'clock, followed by luncheon at 1.30.

Waterless Gasholders.—Latest figures show that the number of waterless gasholders so far constructed, or in course of construction, is 109; this total being divided up as follows: Germany, 54; America, 27; France, 11; Holland, 5; England, 2; and other countries, 10.

Gas Making from Wood.—In a survey of the subject of gas production from wood, published in the December issue of "Industrial and Engineering Chemistry," Mr. O. F. Stafford, of the University of Oregon, finds the outstanding fact to be that the several methods of gas production which have been developed during the past century for use with coal find really a close parallelism where wood is to be carbonized or gasified. Practice has demonstrated that thermal efficiencies in gas-making operations involving these two materials are much the same. Each material has its peculiarities; and these must be thoroughly understood before the technical details concerned in successful gas making can be carried out. Vastly more has been done in the study of coal than has ever been attempted with wood; but in spite of this fact, there is a sufficient accumulation of dependable experience to justify the assertion that in the field of manufacture of low calorific value gas the use of wood deserves much greater consideration.

THE TRAINING OF A FUEL CHEMIST.

By Prof. J. W. COBB, C.B.E.

[Summary of a Paper before the Institute of Chemistry on Jan. 24.]

The conviction that our fuel supplies must be used efficiently and economically is becoming more firmly and generally established, with the result that probably no branch of chemistry provides better opportunities for the right type of man than does fuel. These opportunities come, in the first instance, in connection with the established carbonization industries. The gas industry depends upon scientific practice as to its main products, its bye-products, and the proper utilization of gas, coke, and tar when they are obtained. The development of the gas industry depends on a scientifically trained personnel more than any other single factor, and the coke oven industry is in a similar position. Moreover, the need for economy in fuel utilization, the demands for liquid fuel (particularly motor spirit), the awakening of the public conscience to the evils arising from smoke—all make for the intervention of the scientifically trained fuel technologist.

SELECTION OF SUBJECT-MATTER.

The training necessary has to meet many requirements, and, if it is to be effective without requiring an inordinately long time, a careful selection has to be made of subject-matter. It would be easy to say that such a training should include courses that would mean, in essence, the superposed training of a chemist, a physicist, and an engineer in a university, followed by works experience. Such a scheme, of course, is impracticable, and in any case would prove stultifying by inculcating too exclusively the attitude of the acquirer of knowledge, and not sufficient of the necessary readiness for independent action and making the best use of knowledge already acquired, which is characteristic of the best type of practical man, though not, of course, of the practical man who cannot move except on the lines laid down by the practice of the past.

TRAINING AT LEEDS UNIVERSITY.

The course in fuel or gas engineering as given by the University of Leeds may be used simply as a peg on which to hang further explanation of what is meant by the necessary selection which has to be exercised in framing the course of a fuel technologist. The lecture courses in the first year are given up entirely to basic sciences, chemistry, physics, and mathematics, with an introductory course in general engineering and a short course (one hour per week) in fuel—this last largely for the purpose of making personal contact with the students who are later coming on for the more advanced course in fuel. The second year develops chemistry and engineering further, and begins to deal with such special branches of physics and chemistry as come from the consideration of the properties of gases, thermal efficiencies, calorimetry, and pyrometry—all of fundamental importance to the fuel technologist. The third year may be varied, but is substantially given up to the more specialized subjects of carbonization, fuel, and gas engineering. Laboratory work during these three years is for the first half in chemistry in the chemical, engineering, and physical laboratories, and for the second half in the fuel laboratories, where the special technique of the fuel chemist is learned in connection with furnaces, refractory materials, pyrometry, calorimetry, gas analysis, the methods of testing gas appliances, and the like. Touch with the most modern practice is maintained by short lecture courses given on such subjects as coke oven practice, gas-works practice, distribution, and benzole recovery, by lecturers from outside engaged in those branches of work. Practice in exposition by the students is obtained at a weekly colloquium where new processes or researches are explained by the students themselves. Some works experience is obtained by the students during the long vacation by arrangement with gas-works, coke oven plants, and producer gas plants, though the first vacation course is usually spent at a general engineering works.

This three years' course leads to a degree or a diploma.

RESEARCH.

The fourth year course consists in carrying out under supervision some piece of allotted research work, and is really a training in research methods. That leads by thesis to an honours degree. At the end of three years, the successful student is ready to take a works post in the fuel industries, with a knowledge of the principles underlying the use of fuel and of the laboratory technique employed in fuel work, and with a knowledge of industrial processes which is useful from the beginning, and completed by experience. It can be maintained with confidence that a man so trained is likely to make good.

The fourth year training is not suitable for every student, and is only recommended for those who have some aptitude for research. When taken, however, it is particularly valuable, as experience has shown.

Such is the training in the Fuel Department of the University of Leeds. In the other universities which set out to train fuel chemists, the practice is somewhat different. At London, for example, the fuel training is entirely post-graduate, following upon the completion of a full degree course in science.

The fully qualified fuel chemist is now in great demand. His work is of an interesting character, while his opportunities are great, and likely to be greater.

NOTES ON NEW BOOKS.

"THE MODERN GAS SHOWROOM."*

This book is a happy combination of fact and opinion. In short compass, and in most readable fashion, the author has set out a convincing case in favour of showroom enterprise, and has effectively demonstrated that this method of creating customer goodwill is one not to be left to the large concerns only, but that small gas undertakings can reap enormous benefit by modernizing, at moderate cost, their showroom premises. The value of the book is enhanced by an excellent foreword of great practical worth written by Mr. Cyril G. Davis, M.I.Mech.E., whose wide experience of showroom work entitles his opinions on this subject to be treated with more than ordinary respect and consideration. "If all gas undertakings," he says, "were to realize that everything in the showrooms should be displayed at its best, that an atmosphere of a very high standard should be created, and that officials who come in contact with the public should be of a good type, courteous, and of good address, some undertakings disinclined to spend money on new showrooms would undoubtedly obtain much more benefit from their present showrooms than they have gained in the past." He rightly deplores the tendency in some quarters to overcrowd the showrooms themselves, and also the windows—the function of which is to attract. Mr. Davis has some very pleasant things to say about the Kensington Showrooms of the Gas Light and Coke Company, as also has the author, who, in dealing with the interior of showrooms, includes a brief description of the main principles underlying the lay-out of this—reputed to be the world's finest—showroom.

The book is divided into six chapters. In the first, the author urges that all gas undertakings, irrespective of size, should do all they can—and quickly—to bring their showrooms up to date, and in keeping with the industry's motto of "Service," and consideration is given to the choice of a suitable site. Chapter 2 deals with external and structural features. The question of window frontage is discussed, and attention is drawn to the ventilation of windows and of the showroom generally. Examples of typical conversions of existing buildings into up-to-date gas showrooms are given, complete with illustrations, and the subject of exterior illumination is touched upon. Mention is also made of concealed gas connections. Chapter 3 concerns itself with window display. The question of the relative values of "open" and "closed" windows is discussed, and uniformity of effect, absence of overcrowding, the attitude of passers-by, and other points, are considered. In Chapter 4, as indicative of excellent practice, examples are given of the interior lay-out of large, medium, and small gas showrooms in London and elsewhere, and a short description of the methods employed by the Davis Gas Stove Company is included. Among other items, sectionalization of different types of apparatus in appropriate departments and in their natural surroundings, and segregation of the appliances themselves, come in for comment. Chapter 5 bears the title "The Staffing of Showrooms," and the final chapter deals in some detail with the relation between the gas industry and the architect and builder.

The book is embellished by a large number of excellent illustrations which, in themselves, should be a source of inspiration to those undertakings who lag behind in this important question of showroom enterprise.

* "The Modern Gas Showroom," by A Business Architect, with a Foreword by Cyril G. Davis, M.I.Mech.E. Published for the author by Walter King, Ltd.; price 3s. 6d., post free.

Institution of Heating and Ventilating Engineers.—An ordinary meeting of the Institution will be held at the Holborn Restaurant (Caledonian Room), W.C. 2, on Wednesday, Feb. 9, when Dr. Margaret Fishenden will read a paper on "The Effect of Weather Conditions upon the Heat Requirements of a House."

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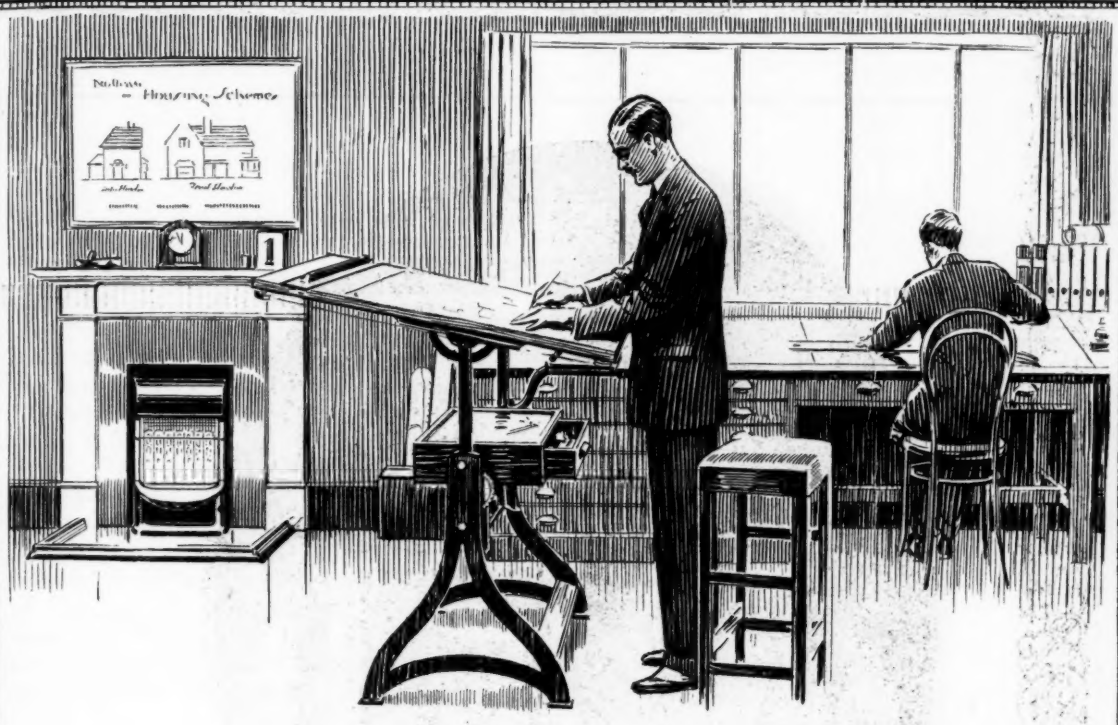

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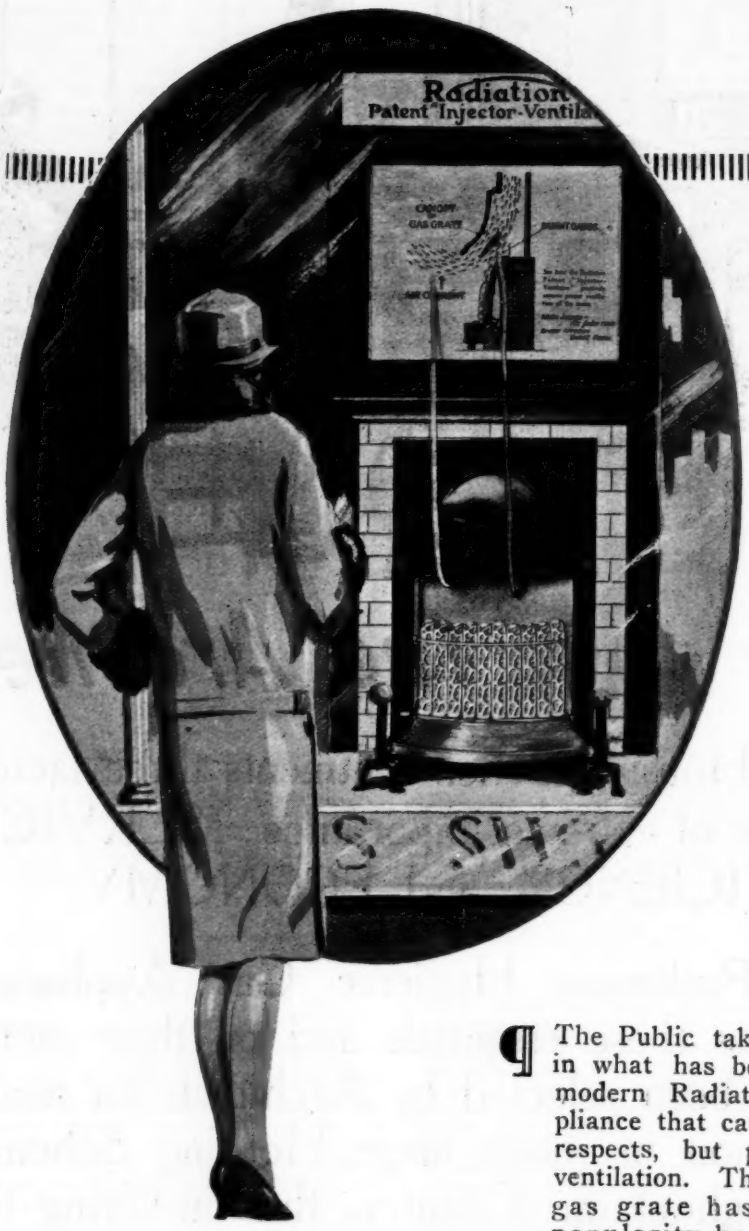

¶ The Public takes a very real interest in what has been done to make the modern Radiation gas grate an appliance that can be relied upon in all respects, but particularly as regards ventilation. The "Injector-Ventilator" gas grate has achieved enormous popularity because of its positive assurance of the utmost satisfaction on all points and under all conditions.

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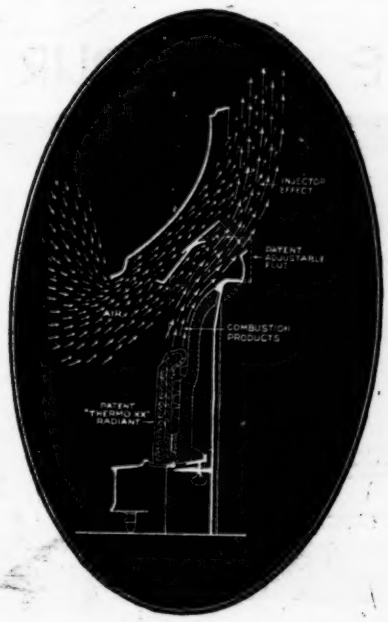

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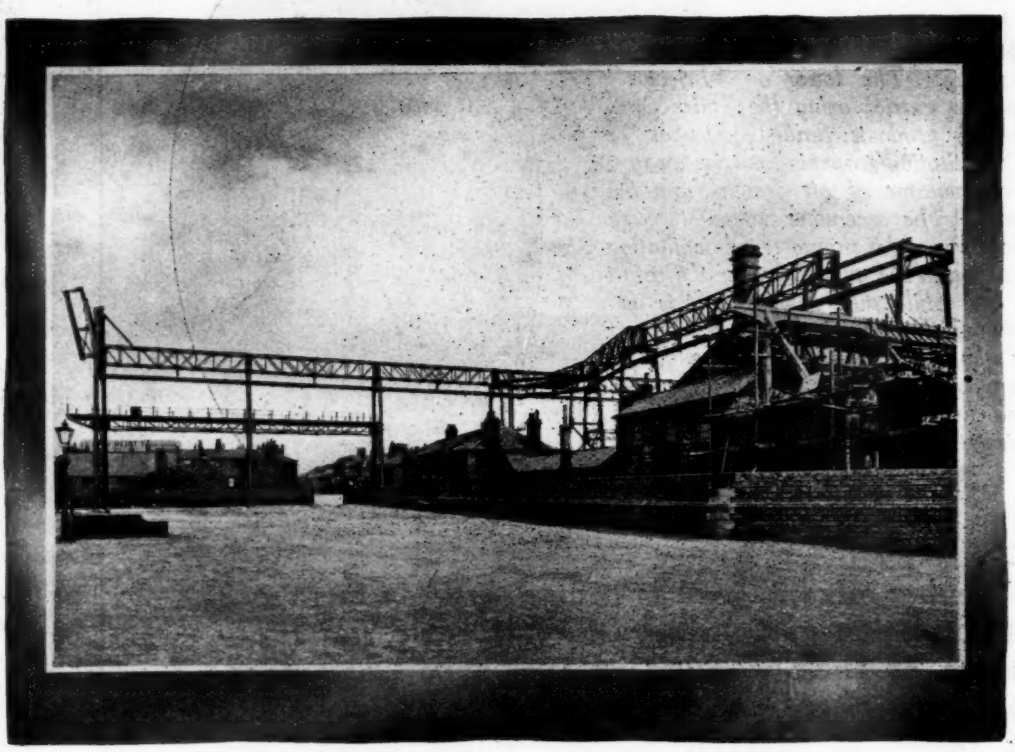

THIS Telpher Plant serves a double duty. The coal is raised by Grab from Ship's Hold and dumped into a Receiving Hopper, from which a Conveyor delivers it to the Overhead Storage Bunkers above the Charging and Discharging Machine. The coke is also taken from the Store in the Gasworks' Yard by this Telpher and loaded into a Cargo Boat on the Wharf Side. This is but a portion of a Plant erected by us in which mechanical methods substitute manual labour. The installation consists of a Steel-Framed Retort House with Brick Filling, containing 4 Beds of Six 24" by 18" Retorts, 20' 0" long, with Stoking Machine, Electrically Propelled Coke Bus, Duplicate Set of Electrical Generators, and the Telpher Plant shown in the illustration.

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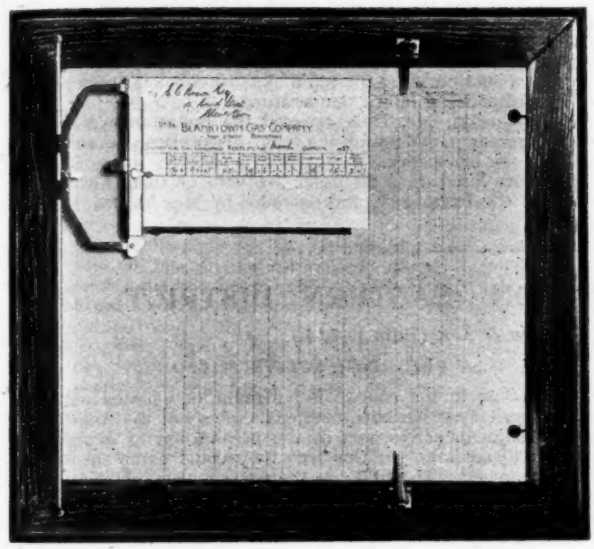
A CLERICAL SHORT CUT.

Gas Accounts and Rental Work.

The need for the reduction of routine clerical work is ever present, and is in many cases difficult to satisfy. Office machines of various kinds are available for those whose quantity of clerical work of a definite character is sufficient to justify the cost, maintenance, and operation of expensive and intricate appliances. Large gas undertakings have reaped the advantage of such machinery in their offices, and considerable savings, together with increased efficiency, are experienced; but, unfortunately, the smaller undertakings have been left to continue many of the tedious routine operations by hand.

Chief among these is the posting of the gas rental or ledger, and making out the gas accounts. This can be carried out economically with a machine by one operation, where the



number of entries is sufficiently large; but it is usually a hand operation for those undertakings with less than 5000 credit consumers. Extensive experiments in this connection have been carried out by the Commercial Organization Section of the "B.C.G.A.," and have resulted in the production of a very simply operated, but most effective, device for assisting in this hand work. This is known as the "Rental Account Duplicator." It is exceedingly simple in every detail, as the illustrations indicate, and has the great advantage that it can be used with any modern accounts system without alteration, except to the gas account, which must be horizontally instead of vertically tabulated.

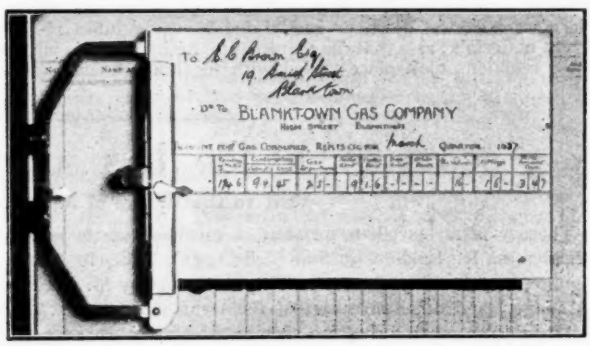
Illustrations show the leaf of the rental ledger fixed in position, and an account clipped in the holder. The account is made out (in ink), and by means of a hard-surfaced carbon paper is copied direct on to the rental sheet; registration being effected by a spring and gauge on the sliding rod. A pointer is provided to assist the registration of the account in its clip; and a further pointer is used to indicate the line of the rental in which the entry is being made. Subsequent entries are made by sliding the holder one stage down the gauge rod. The holder is hinged, so that it may be lifted completely off the rental sheet. The carbon paper is held by a separate clip; and, by the use of a screen, entries, such as name and address, account number, &c., can be made on the account without being carried through to the rental sheet.

The advantages claimed for this "short cut" are as follows:

1. Reduction in clerical work, by rendering it possible to make out accounts and post rental at one operation.
2. Elimination of copying errors.
3. Saving of time in cross-checking accounts with rentals.
4. Speeding-up the issue of accounts.

The following points may be raised as objections:

(*a*) The use of carbon paper for the gas rental. This, however, is not an uncommon practice in the industry,



and is essential where machinery is used. Special carbon paper is employed which gives a clean impression, and does not smudge.

(*b*) The use of loose sheets out of the rental. This in practice does not present any serious difficulty, if the binder is opened and sheets are taken as required from one side and replaced in the other.

(*c*) Horizontally tabulated gas accounts. Accounts in this form may appear strange at first; but use eliminates any difficulties, and ultimately such a form becomes as convenient as those tabulated vertically. In many respects the horizontal pattern is more convenient, as each item is shown clearly under its heading.

The "Rental and Account Duplicator" is obtainable only from the "B.C.G.A." Any interested member should send a copy of his gas account and rental sheet, together with an outline of his system, to the Secretary of the Association, who will supply fullest information and advice on the adaptation of the "Duplicator" to the specific needs of the member.

ATMOSPHERIC NITROGEN.

On Saturday, Jan. 29, Mr. A. J. DALE, B.Sc., A.I.C., delivered an interesting lecture before the Stoke-on-Trent Association of Engineers, on "Atmospheric Nitrogen." The chair was occupied by the President, Mr. A. T. GREEN, A.Inst.P.

During the course of the lecture, Mr. Dale said that there are two main sources from which this country obtains its supply of nitrogen compounds. First, the natural geological reservoir, the nitrate beds of Chili; and secondly, from bye-product ammonia compounds. With regard to the Chilean supply, there are two points worthy of mention. First, the official Chilean estimates predict that the deposits in that country will be exhausted in 200 years; and secondly, it is conceivable that in time of war this foreign supply may be entirely cut off. Long ago the Germans realized the possible failure of the Chilean supplies of fixed nitrogen; and they guided their laboratory experiments so as to make them independent of foreign sources for the basic raw materials for explosives and the necessary compounds for accelerating the internal production of foodstuffs. To the Germans, apparently, we owe the realization that the atmosphere we breathe constitutes an almost inexhaustible supply of nitric acid. The potentialities of this source of fixed nitrogen may be better appreciated when we realize that a column of air over a square mile of the earth's surface contains twenty million tons of nitrogen.

EARLY WORK.

It was the English scientist, Cavendish, who, about 1785, first showed definitely that nitrogen could be caused to combine with oxygen, by enclosing air in a tube, and passing an electric spark through it. Priestley, also experimenting in this direction, showed exactly the reverse. In the light of later experiments both were proved to be right to a certain extent, as the action was shown to be a reversible one.

FORMATION OF NITRIC OXIDE.

The argument has been advanced that the formation of nitric oxide in the arc is simply a temperature effect. Haber, the German scientist, has suggested that the thermal action is secondary to an effect which is of a purely electrical nature. He considers that, under a high potential gradient, the oxygen and nitrogen become ionised, and that the ions themselves are capable of union, producing nitric oxide. This action, then, should occur at low temperatures; and the disintegrating effect of high temperature, as shown by Priestley's experiment, and the need for sudden cooling, are eliminated.

DESCRIPTION OF NITROGEN PLANTS.

In the Birkeland-Eyde plant, an alternating current supply,

at a pressure of about 5000 volts, is applied to two copper electrodes, which are water cooled. The arc set up is under the influence of a magnetic field, which causes it to spread out until it is of the form of a circular disc, almost 6 ft. in diameter. Air is passed through the arc; the high temperature causing the oxygen and nitrogen to combine and form nitric oxide. The hot gases are drawn out of the furnace chamber, and pass through cooling devices in which the heat is extracted to preheat the incoming air, to raise steam, and to heat water. Finally the gases are passed through absorption towers containing granite chippings; and as the gas passes upwards through the towers, it meets a stream of alkali—such as caustic soda—and nitric acid or a nitrate is thus formed.

In 1905, Schonherr found that a stable arc of great length, up to 21 ft., could be maintained in the axis of a tube along which a current of air passes, and that the stability of the arc is augmented if the air passes with a spiral motion. In this arrangement, the air flows along the arc, and consequently the heating time is greater. Yet the yield in the Schonherr process is greater than that of the Birkeland-Eyde, being 2·5 p.ct. as compared with 1·5 p.ct. This result is only explicable if we accept Haber's ideas of ionisation. It has been computed that, of the total electrical input to these furnaces, 40 p.ct. appears as hot water, 30 p.ct. as steam, 17 p.ct. is lost by conduction and radiation, and 10 p.ct. is lost by water cooling, leaving only 3 p.ct. to be used in the actual production of nitric acid.

Later experiments showed that the chemical reactions taking place were slowed down or accelerated by using tubes of different materials; also that the temperature limits between which these reactions took place varied with the kind of tube used. Further, much depended on the time of contact of the air with the arc. Ammonia is also decomposed by sparking; and the reverse process, the synthesis of ammonia, was soon appreciated. The formation of ammonia from a mixture of nitrogen and hydrogen is accompanied by a decrease in volume. Therefore an increase of pressure should favour the synthesis of ammonia. Nitrogen can be readily obtained from liquid air, and hydrogen from the electrolysis of water or the action of certain acids on metals. Hence ammonia synthesis should be feasible.

THE HABER PROCESS.

Haber, in the plant which he has developed, employs several of these principles to obtain the maximum yield of ammonia. The nitrogen and hydrogen are passed into an iron tube heated externally, by an electrical resistance, to a temperature of 500° C. At the bottom of the tube is a catalyst. The gas is under a high pressure, and the whole tube is fitted into a chamber, in which the same pressure exists as inside the tube itself. This relieves the tube of the stress, which, at the temperature at which the operation occurs, would render the apparatus extremely dangerous. The gases, now united, are led away, and are rapidly cooled by allowing them to expand through a small orifice; the rapid expansion being accompanied by a corresponding fall of temperature.

In conclusion, Mr. Dale stressed the importance of fundamental research. Most of the vital discoveries, he said, are made in the laboratory.

After an interesting discussion, a vote of thanks was proposed by the PRESIDENT, and seconded by Mr. JOLLEY.

SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).

Visit to the Works of Messrs. R. Laidlaw & Son (Edin.), Ltd.

There was an excellent turn-out of members at the works of Messrs. R. Laidlaw & Son (Edinburgh), Ltd., in Simon Square, on Saturday, Jan. 22. They were met by Mr. Brown (Manager) and other members of the technical staff.

Mr. BROWN, welcoming the visitors, first apologized for the unavoidable absence of Colonel Laidlaw, who was away from Edinburgh. The works, he said, though old-established, were a combination of old and new sections. He hoped the visitors would see something of real interest. In addition to the making of gas meters, the firm were engaged in the manufacture of general brasswork.

Parties were formed, and, accompanied by guides, were conducted over the works, where it was noted that a large number of the employees had sacrificed their Saturday afternoon, in order to be at the machines, and thus enable the visitors to follow the processes of manufacture of the various appliances.

In the brass fittings warehouse and general stores, where there are kept in stock, ready for assembling, all parts and fittings of meters, &c., there were laid out the components of both old and new capacity rated meters. Thus the visitors had an opportunity of observing the changes recently made in respect of new type high capacity meters. Members saw in the engineering workshops stamping machines in operation, producing an assortment of both large and small stampings for meter cases, &c. In the water meter shop were clearly seen the various stages in manufacture; and a sectional model illustrated the principle on which these meters operate. The meter proving and Government testing stations were then visited. It was explained at this stage that Mr. Gordon (Chief Inspector of Meters for the Edinburgh area) had kindly offered to demonstrate the testing apparatus; but through force of circumstances this arrangement had had to be abandoned. It is to be hoped that Mr. Gordon's offer will not pass unfulfilled. Proceeding to the meter building shop, the visitors saw the various processes of assembling meters. The brass foundry, where a special casting was made during the visit, was then inspected. The brass finishing shops, meter index and prepayment mechanism departments, and leather diaphragm testing, assembling, and protective treating shops were passed through, and the various machines and processes seen in operation. All through were noted the thoroughness and accuracy of the firm's work.

In the evening the visitors were entertained at tea in the town, after which Mr. Brown, who occupied the chair, said it had given him great pleasure to meet the members of the Association. He expressed the hope that they had benefited by their inspection of the works.

Mr. M. DARLING (President) expressed the thanks of the members to the firm for the privilege of inspecting the works, and for their kind hospitality; and he asked Mr. Brown to convey their thanks to Col. Laidlaw. He also thanked Mr. Brown and his assistants who had acted as guides.

To this the members heartily responded.

The PRESIDENT then took the chair, and called on the Hon. Secretary, Mr. D. Yule, to read his paperette.

A PLEA FOR ACTIVE SUPPORT.

Mr. YULE, in the course of his remarks, pointed out how necessary it was that the younger members of the Association should take an active part in the preparation of papers and in their discussion. In this way they could equip themselves with knowledge essential for the carrying-out of their work in the industry. It did not greatly matter, he said, if blunders were made at first, for it was only by mistakes and experience that they could progress. Many capable young members, he thought, were failing in their duty if they did not express their views. He urged them to be positive, not negative, members of their Association.

Discussion.

The PRESIDENT said they were indebted to the Hon. Secretary for his paperette, which was timely. It was to be hoped that more members would take advantage of the inducements offered by the prizes.

Mr. MOYES said that during his term of office as Hon. Secretary he had found rather a lack of support given by the members in introducing subjects for discussion. Every young man ought to be able to express himself intelligently, because there might come a time when he would be appointed to some position in which it was essential.

Mr. URQUHART (Tranent) remarked that, as Manager of a small works, he had found of considerable value a spirit of co-operation and friendliness with neighbouring managers of similar works.

Mr. SPENCE (West Wemyss) pointed out that he was rather an "old stager," who had not had the same opportunities as were now offered to the young men of the industry in regard to education. This applied, perhaps, particularly to those in the Edinburgh area, where there was the Heriot-Watt College, for example—one of the finest technical schools, equipped with splendid laboratories. These young men could surely give a paper on some subject, and in this way help those who were not so fortunately placed.

Mr. GOURLAY agreed that there was a great deal of benefit to be derived from discussion, and thought there had not been enough of it recently.

Mr. GAVIN said it was really difficult to find something new to talk about; and any scarcity of papers, he was sure, was due to this.

Mr. BROWN considered that visits such as they had that day made were more interesting than listening to papers and discussions.

The PRESIDENT, in closing the discussion, appealed to the younger members to "get on their feet" at every opportunity.

There will be a paper by Mr. D. Warden, of Dundee, on "Sheet Metal; Its Relation to the Gas Industry," on the occasion of the visit to the Dundee Gas-Works on March 26.

Books Received.—We have received from Dr. Jerome J. Morgan, Associate Professor of Chemical Engineering, Columbia University, Vol. I. of "Manufactured Gas: A Textbook of American Practice." Vol. II. will not be ready for about another year; and its scheme comprehends distribution, utilization, and some business aspects. The price of Vol. I. (which deals with production) is $7·50; and the publisher is the author, of Broadway, at 119th Street, New York City. A review will appear in due course.

MODERNITY OF HORIZONTAL RETORTING.

By H. J. TOOGOOD, Director of Messrs. Robert Dempster & Sons, Ltd.

The choice of carbonizing plant, in spite of gratuitous advice galore, remains the Sphinx's riddle among the problems coming within the life of every gas engineer. Efficiency, that many-sided theme, must be tracked through its technical, commercial, and expedient phases to its lair, weighed in the balance of local conditions, and thrashed to that finality of efficiency, over-all efficiency-in-use. Epoch-making factors which in recent years have remodelled the gas industry itself have moulded the modern trend of invention, so that to-day the horizontal retort bears the closest comparison with its compeers.

The new economic circumstances which have revolutionized the carbonizer's outlook are:

The Gas Regulation Act of 1920—*i.e.,* the more general need for constancy in both calorific value and specific gravity.

Coke competition, used in the widest sense of the word.

The disastrous coal strike, and its lesson in showing the inherent property of the horizontal retort to deal indiscriminately with all sorts and conditions of coals.

The *summum bonum* of the operation of these laws with the horizontal retort is:

To satisfy efficient gas distribution in existing mains and services, the erstwhile low-grade gas has been raised to average 500 B.Th.U. Consequently the horizontal retort, with its ability to yield high-grade gas, steps into the front line of carbonizing machinery.

The greater uses of coke in (and its preparation for) the domestic fuel market have set an increased bonus on coke sold per ton of coal carbonized—the prime factor in reducing the net cost of coal. The horizontal retort having a penchant for maximum coke yield has here an added economy.

The engineer, having a greater range in his choice of coal, can search more widely, and purchase more cheaply—particularly in times of stress.

In sympathy with the above philosophy, the following illustrated description of a rare collection of improved details of special interest, developed by my firm, Messrs. Robert Dempster & Sons, Ltd., Elland, consummates what virtually is a brand-new system of horizontal retorting.

MAIN ARCH.

This is conspicuous by its absence. In its place is substituted a simple cover, built entirely from square bricks, resting directly upon the stay-walls of the setting. This simple departure from the practice of a hundred years gives the following advantages:

(1) Upward expansion and growth of silica perfectly accommodated at all times, as the bench cover simply rises to accommodate exactly the volumetric change of the heated silica.

(2) The thrust of the erstwhile main arches is non-existent, so that the longitudinal tie-bars and end buckstays are relieved of considerable strain.

(3) The absence of main arches renders each setting an individual unit. Thus each setting absorbs within itself its own expansion, so obviating the usual and cumulative expansion in the length of the bench. Thereby all centres of mouthpieces remain in exact alignment for the best working of modern machine stoking.

(4) Economy of construction is obvious, as wood centers are saved, and cutting of bricks round the interior and exterior of the main arch is obviated. Moreover, the retort setters work without stooping or remaining in a cramped position, and when resetting they have a cooler and more straightforward kind of work. Simple props are used; there being no main arch to create a thrust.

(5) Efficiency is enhanced, because there is less mass brickwork to heat up and maintain hot. Hence a perpetual saving in fuel is established; and, furthermore, the decreased height of the bench reduces first cost of installation.

RETORTS.

These are built-up from converted 95 p.ct. silica segments, jointed with grooves and tongues, as closely as practicable, with material ground to a definite degree of fineness approximating to the same analysis as the silica segments themselves. The segments span between the stay walls, which are brought closer together than usual, and are 9¼ in. apart, thereby reducing the span of the silica segment and increasing the strength of the retort. The retort ends are in toughened firebrick, to obviate spalling and cracking of silica due to the rush of cold air at the open end of the retort.

STAY WALLS.

The inside stay walls are wholly of 95 p.ct. silica, so that the retorts shall lift on an even keel, and the gastight properties remain unimpaired.

ABSORBING SIDE EXPANSION OF SILICA STAY WALLS.

Silica, as it is converted by prolonged heating, gradually and permanently grows an extra 0 to 0·5 p.ct. relative to the expansion of firebrick. Furthermore, the thermal expansion of silica occurs spasmodically at considerably lower temperatures than with firebrick; and as silica occupies the interior of a setting, and firebrick the exterior, it is clear that allowance for expansion must operate at a temperature considerably below that of red heat. Consequently the allowance should be of a two-fold nature—viz., first by crushing, secondly by combustion, or burning away. This is accomplished by the use of corrugated cardboard built-in adjacent to the pier walls, and of thickness proportioned to the grade and mass of the particular silica.

HEAT TRANSMISSION.

The stay walls are so proportioned and spaced that 60 p.ct. of the retort walls is exposed to the heating medium, thereby enhancing the ability to burn-off heavy charges of slack coal in regular periods of time, with the utmost economy of fuel.

COMBUSTION CHAMBER ARCHES.

To attain maximum strength, the combustion chamber arches are completed as perfect ellipses, and are of such proportion as to circumscribe the inner cone of the flame of combustion issuing from the producer-gas nostril, whence impingement of the dust-laden flame is at the minimum. Still further to mitigate the deleterious effect of flue dust, bull-nosed bricks are used in building the above arches.

PRODUCER ARCH AND COMBINED KEYSTONE.

The crown of the producer arch and the producer-gas nostrils are built from 95 p.ct. silica; and the crown blocks are so shaped that, while they form the nostrils, they likewise give perfect abutments for the springing of the series of combustion chamber arches. Thus the following advantages are effected in this vital part of the setting:

(*a*) The keystone of the producer arch cannot lift by expansion thrust of the arches.

(*b*) All nostrils, both for secondary air and for producer gas, are brought into visibility.

(*c*) The elliptical arch is sufficiently large for the retort setter to work comfortably during periods of repair.

PRODUCER.

As the producer is the finest example of the efficiency-in-use of gas-works coke, it is well that gas engineers should give their own producers close consideration, so as to prove their bye-product coke to be a cheap, efficient, and smokeless fuel.

Non-Clinkering Screen Bar-Grate.—This can best be described by analogy with the working of a stepped grate. With a step grate, each step tends to hold the coke stationary in small mounds, which mounds are quickly agglomerated by ash, thus disturbing the working of the fire, and requiring the attention of the furnace man. With the steeply-inclined and smooth screen-bar grate, no such mounds can exist. The coke creeps continuously down the grate, and the ash gravitates into the ashpan, leaving the incandescent coke in this primary zone of combustion more active and in open formation. Thus are the arduous clinkering period and attendant losses entirely overcome, and the producer-gas both qualitatively and quantitatively fed into the setting to maintain the heats in an ideal and economic manner. This grate is really a legacy of the great war, as it proves once again the proverb "Necessity is the Mother of Invention," because when there was a lack of skilled furnacemen to perform the arduous work of clinkering, then invention arose to fill the want—a non-clinkering grate which enabled women to carry on in many of the retort houses of the country. There are hundreds of these grates working so successfully that one furnaceman can attend up to fourteen fires; and the fuel consumption is so efficient that only 10 lbs. of coke are required per 100 lbs. of coal carbonized.

Constant Depth of Fuel.—This desirable feature is accomplished by a curtain wall so arranged that no leakage of atmosphere from the furnace charging door can enter the producer gas chamber without passing through a considerable depth of incandescent coke. Thus is the quality of producer gas maintained at the highest value, the quantity regular, and leakage at the charging door reduced to a negligible amount.

Twin Producer Gas Flues and Dampers.—The above curtain facilitates the employment of a pair of producer gas dampers, which control independently the producer gas to each half of the setting, for purposes of added economy. The twin producer gas flues are arranged side by side, and covered by the producer gas arch, and are therefore easy of access for examination and cleaning, and for regulation of the dampers from the dumb-chamber.

Ashpan Doors.—It will be observed that, the fire being controlled from the producer gas side, it is optional whether ashpan doors be fitted. Thus it will be seen that the usual practice

of controlling three media—viz., secondary air, primary air, and waste heat—is greatly simplified by cutting out the regulation of the primary air.

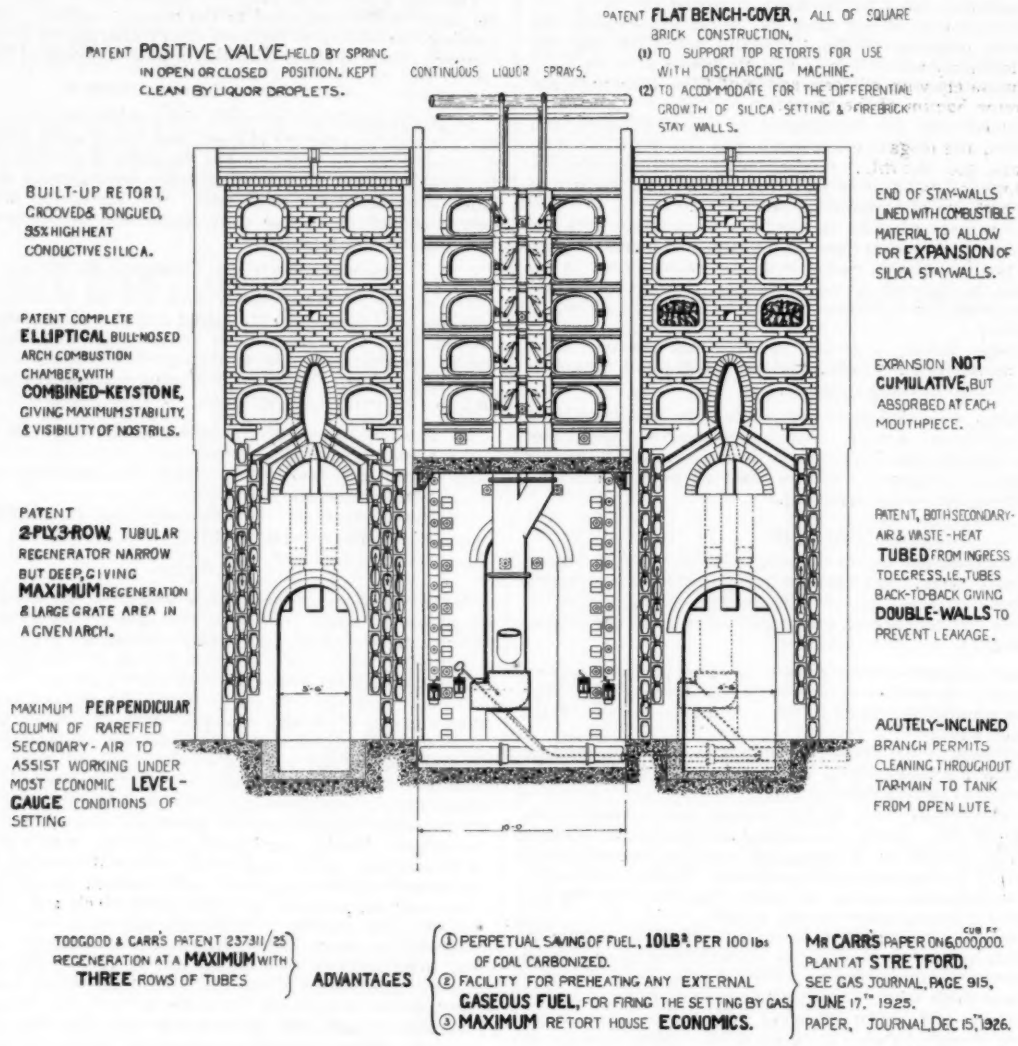
Furnace Charging Door.—This is hinged and balance-weighted, so that its operation is rendered easy. It is doubly sealed—that is, it has the usual metal-to-metal sealing face—and additionally, and quite optionally, dust may be placed in the annulus surrounding the lid, to make a further seal (such dust falling harmlessly away on the opening of the door). The interior of the door is insulated with porous insulation material.

Furnace Linings.—These are built from specially hard-burned close-jointed, high-alumina bricks, which are backed by the regenerator tubes. This makes a much tighter construction than the usual method of brickwork and brick flues.

It will be understood that, if no steam or water vapour were used, then the primary combustion of the carbon of the coke and oxygen of air would be so intense that the inherent ash in the coke would be fused to clinker, and damage to linings, as previously explained, would be increased. Therefore steam or water vapour when used may be considered as a remedy, inasmuch as it finds alternative utilization of the sensible heat to form water gas, rather than the dense clinkers in Zone 2 referred to, by which means the amount of clinker is reduced, to the advantage of the life of the linings. The limit of the quantity is soon reached, as, if too much be used, the temperature of the incandescent coke falls below that at which the conversion of CO in sufficient quantity can take place, and impoverished producer gas follows.

In this new setting, a substitute for steam and water vapour

DEMPSTER-TOOGOOD DESCENSION SCRUBBER PIPES AND MODERNIZED HORIZONTALS.


PATENT POSITIVE VALVE, HELD BY SPRING IN OPEN OR CLOSED POSITION. KEPT CLEAN BY LIQUOR DROPLETS.
CONTINUOUS LIQUOR SPRAYS.
PATENT FLAT BENCH-COVER, ALL OF SQUARE BRICK CONSTRUCTION.
(1) TO SUPPORT TOP RETORTS FOR USE WITH DISCHARGING MACHINE.
(2) TO ACCOMMODATE FOR THE DIFFERENTIAL GROWTH OF SILICA SETTING & FIREBRICK STAY WALLS.
BUILT-UP RETORT, GROOVED & TONGUED, 95% HIGH HEAT CONDUCTIVE SILICA.
END OF STAY-WALLS LINED WITH COMBUSTIBLE MATERIAL TO ALLOW FOR EXPANSION OF SILICA STAYWALLS.
PATENT COMPLETE ELLIPTICAL BULL-NOSED ARCH COMBUSTION CHAMBER, WITH COMBINED-KEYSTONE, GIVING MAXIMUM STABILITY & VISIBILITY OF NOSTRILS.
EXPANSION NOT CUMULATIVE, BUT ABSORBED AT EACH MOUTHPIECE.
PATENT 2-PLY 3-ROW TUBULAR REGENERATOR NARROW BUT DEEP, GIVING MAXIMUM REGENERATION & LARGE GRATE AREA IN A GIVEN ARCH.
PATENT, BOTH SECONDARY-AIR & WASTE-HEAT TUBED FROM INGRESS TO EGRESS, I.E., TUBES BACK-TO-BACK GIVING DOUBLE-WALLS TO PREVENT LEAKAGE.
MAXIMUM PERPENDICULAR COLUMN OF RAREFIED SECONDARY-AIR TO ASSIST WORKING UNDER MOST ECONOMIC LEVEL-GAUGE CONDITIONS OF SETTING
ACUTELY-INCLINED BRANCH PERMITS CLEANING THROUGHOUT TAR MAIN TO TANK FROM OPEN LUTE.
TOOGOOD & CARR'S PATENT 237311/25 REGENERATION AT A MAXIMUM WITH THREE ROWS OF TUBES
ADVANTAGES
(1) PERPETUAL SAVING OF FUEL, 10LB³. PER 100 lbs OF COAL CARBONIZED.
(2) FACILITY FOR PREHEATING ANY EXTERNAL GASEOUS FUEL, FOR FIRING THE SETTING BY GAS.
(3) MAXIMUM RETORT HOUSE ECONOMICS.
MR CARR'S PAPER ON 6,000,000 CUB FT PLANT AT STRETFORD, SEE GAS JOURNAL, PAGE 915, JUNE 17TH 1925.
PAPER, JOURNAL DEC 15TH 1926.

Flexibility of gas manufacture the same under the thermal standard in all types of carbonization ("JOURNAL," Aug. 11, 1926).

1927 Horizontal Retorting—Stopped pipes prevented; all difficulties of expanding silica overcome by simple omission of main arch.

CO_2 as Cooling Medium.

In present-day producer practice, the wear of the furnace linings is due to several distinct causes. First, the steam and air, after passing the grate bars, have little injurious effect on the bricks, but tend to disintegrate the jointing material between the bricks. Secondly, and further removed from the firebars, a zone of intense heat is set up as the air combusts with the coke, giving rise to clinker formation on a portion of the lining, which not only destroys a portion of the brick material, but causes mechanical injury to the lining in the removal of these clinkers. Thirdly, and still further removed from the firebars, there is a zone wherein the lining, though remaining smooth over a relatively large area, suffers from a surface erosion or corrosion, due to chemical reaction of the newly formed, or forming, water gas.

is provided by admitting waste flue gases in sufficient proportion only (by dilution of the air) to reduce the sensible heat of the incandescent coke below the fusing point of the ash. This, while preventing, or reducing, clinker formation in the one zone, obviates the erosive or corrosive effect of water gas on the linings in the other zone.

Regenerators.

These are of two constructions, as shown:

(1) Two-ply, two-row, for coke fired settings.

(2) Two-ply, three-row, for solid or gaseous fuel *ad. lib.*

They are cellular in construction, built completely with machine-made smooth fireclay tubes; the secondary air being tubed all the way from the ingress to the combustion chamber, and the waste heat all the way from the ingress to the main flue. Thus an extremely air-tight, but thin, two-ply division

is formed between the waste heat and secondary air, whereby the efficiency of regeneration is at the highest.

The full depth of the heated brickwork (12 to 14 ft.) is utilized by regenerator tubes. The taller column of heated air passes into the combustion chamber, even though the setting may be working under a slight pressure. The waste-heat tubes are large, and point horizontally to the outer wall. Thus they can be readily inspected, cleared of dust, and repaired from the inside.

For low fuel consumption, within the confines of a setting, regenerators cannot be too large. The three-row regenerator can be adopted without increasing the width of arch, and gives a three-fold advantage:

(1) A very low fuel consumption.
(2) A means for pre-heating any outside source of gaseous fuel—*i.e.*, producer gas made from breeze, or coal gas—at any future period, without altering the setting or letting-down the heats.
(3) The ability to change at will to either gaseous or solid-fuel firing, to take advantage of the coke market.

Secondary Air Control.—The secondary air for the setting is controlled by eight inlet slides. Thus a definite control is given for each quarter-length of the retort on each side of the setting; and, it being possible to control the secondary air to such fine limits, not only are good heats ensured, but fuel consumption is maintained at the greatest efficiency.

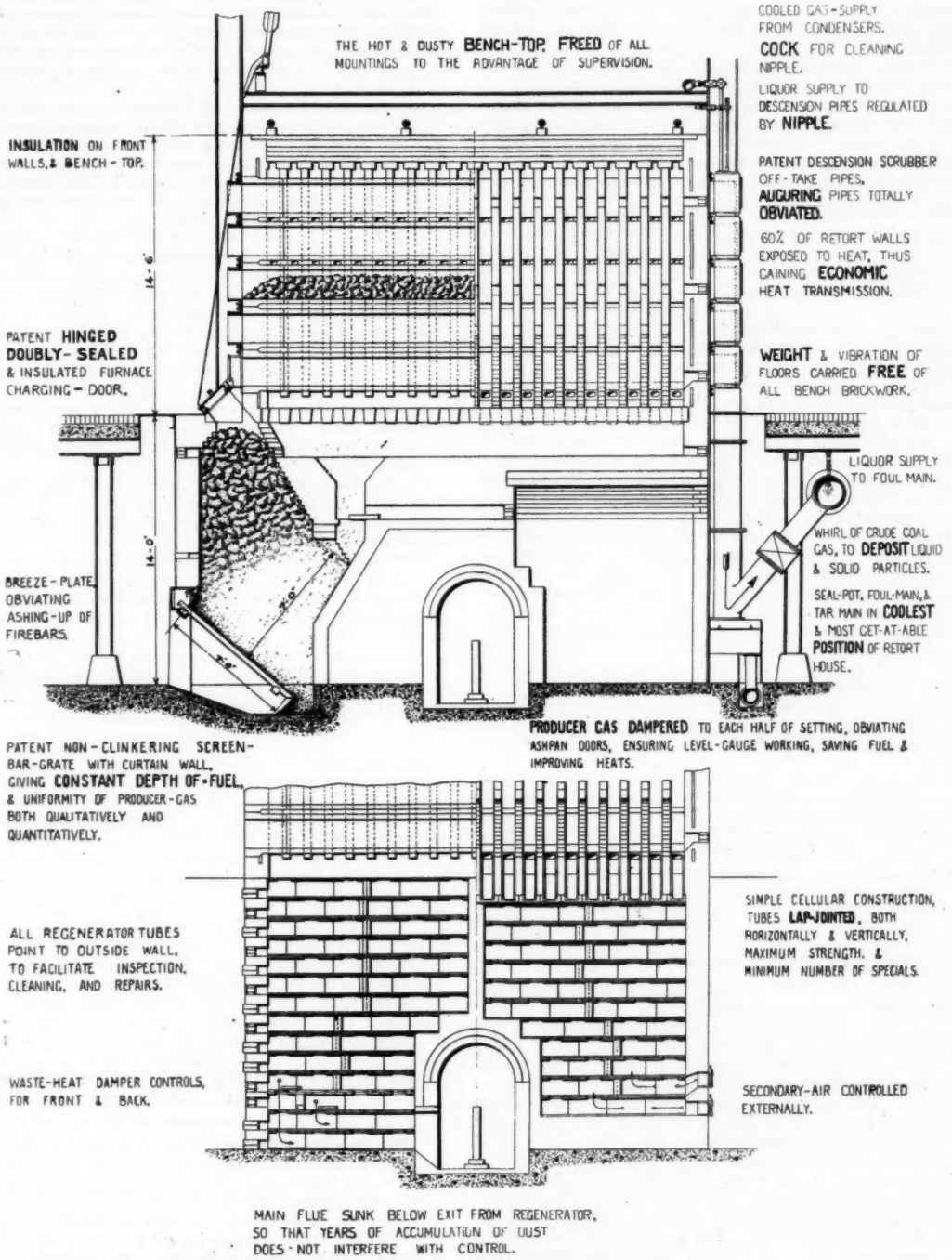
Waste-Heat Control.—Similarly, by dampers shown in the tubes, the waste heat is exhausted or controlled from each quarter-length of the retort on each side of the setting by eight waste-heat dampers just inside the outer walls, where they can be readily seen and inspected, and operated with greater certainty.

Insulation.—The top of the bench is insulated with porous insulation bricks; and the front walls are provided with a layer of insulation material built into the cavities formed within the walls.

DESCENSION SCRUBBER PIPES.

In the history of gas manufacture, it has become axiomatic that coal gas on leaving the retort should be cooled slowly to maintain the candlepower. To-day gas is being manufactured

HIGH-TEMPERATURE CARBONIZATION


THE HOT & DUSTY BENCH-TOP FREED OF ALL MOUNTINGS TO THE ADVANTAGE OF SUPERVISION.
COOLED GAS-SUPPLY FROM CONDENSERS.
COCK FOR CLEANING NIPPLE.
LIQUOR SUPPLY TO DESCENSION PIPES REGULATED BY NIPPLE.
INSULATION ON FRONT WALLS & BENCH-TOP.
PATENT DESCENSION SCRUBBER OFF-TAKE PIPES, AUGURING PIPES TOTALLY OBVIATED.
60% OF RETORT WALLS EXPOSED TO HEAT, THUS GAINING ECONOMIC HEAT TRANSMISSION.
14-6"
PATENT HINGED DOUBLY-SEALED & INSULATED FURNACE CHARGING-DOOR.
WEIGHT & VIBRATION OF FLOORS CARRIED FREE OF ALL BENCH BRICKWORK.
LIQUOR SUPPLY TO FOUL MAIN.
14-0"
WHIRL OF CRUDE COAL GAS, TO DEPOSIT LIQUID & SOLID PARTICLES.
BREEZE-PLATE OBVIATING ASHING-UP OF FIREBARS.
SEAL-POT, FOUL-MAIN, & TAR MAIN IN COOLEST & MOST GET-AT-ABLE POSITION OF RETORT HOUSE.
PRODUCER GAS DAMPERED TO EACH HALF OF SETTING, OBVIATING ASHPAN DOORS, ENSURING LEVEL-GAUGE WORKING, SAVING FUEL & IMPROVING HEATS.
PATENT NON-CLINKERING SCREEN-BAR-GRATE WITH CURTAIN WALL, GIVING CONSTANT DEPTH OF FUEL, & UNIFORMITY OF PRODUCER-GAS BOTH QUALITATIVELY AND QUANTITATIVELY.
SIMPLE CELLULAR CONSTRUCTION, TUBES LAP-JOINTED, BOTH HORIZONTALLY & VERTICALLY, MAXIMUM STRENGTH, & MINIMUM NUMBER OF SPECIALS.
ALL REGENERATOR TUBES POINT TO OUTSIDE WALL, TO FACILITATE INSPECTION, CLEANING, AND REPAIRS.
WASTE-HEAT DAMPER CONTROLS, FOR FRONT & BACK.
SECONDARY-AIR CONTROLLED EXTERNALLY.
MAIN FLUE SUNK BELOW EXIT FROM REGENERATOR, SO THAT YEARS OF ACCUMULATION OF DUST DOES NOT INTERFERE WITH CONTROL.

FOR MAXIMUM COAL CONSERVATION.

for its calorific value; and therefore this desideratum has now lost its point. Yet designers of plant hesitate about new departures. The suggestion has been made to permit liquor to gravitate down ascension pipes; but this, while it endeavours to cool rising gas by descending cold liquor, is working in a vicious circle, inasmuch as the gas, while being cooled, rises adjacent to the heated brickwork to the relatively hot position at the top of the bench.

To overcome the above disadvantages, the present descension scrubber pipe has been developed, the objects of which are:

(1) To provide means which in themselves are more simple and less costly per unit volume of gas dealt with.
(2) To shock-cool the gas in a better manner—seeing that the cooling is done in the relatively cool subways, rather than above the hot bench brickwork, where all hot air tends to rise.
(3) The issuing crude coal gases are led directly downwards to the cool subways adjacent to the cool brickwork.
(4) Instead of cramping these pipes adjacent to the buckstays, and opposite the heating flues of the retorts, they are grouped on the centre-line of the bench in front of the cool and airy dumb-chamber, where there is plenty of room for circulation to carry out this shock-cooling.

Mouthpieces and Segments of Scrubber Pipe.—Each mouthpiece is bolted to its own segment of scrubber pipe; and each segment of scrubber pipe is jointed to its neighbour by a socket (the joint being made after heats are up). Thereby the difficulties of expansion of bench brickwork are wholly and neatly evaded.

Valve Seating.—The valve seating is arranged virtually on the mouthpiece itself, thus obviating all need of a branch connection, and saving all pipe augering to clean same.

Gas-Tight Valve.—A detachable valve of the self-cleaning, self-centring mushroom type is provided for each retort. This can be ground to its seat at any time (*in situ*) by a square shank projecting into the self-sealing mouthpiece. The valve and all gear, being mounted on a detachable flange, can be readily withdrawn, if required. It will be observed that the valve in its open position is continually washed by the spray of liquor.

Lever to Operate Valve.—The external lever to operate the valve is keyed in exact alignment with the valve, so that it always gives external and automatic evidence of the actual position of the interior valve. Each valve has an external spring, which is specially arranged so that it passes the dead-centre of motion, and holds the valve firmly in either the open or the closed position, making its working positive, and ensuring close seating of the valve. The stoker need only move the lever to the right hand or left hand, and the spring completes the operation automatically, and securely.

Descension Pipe.—This is of large area for slow movement of crude coal gas under level-gauge conditions. Its cross-sectional area is 100 sq.in.—equivalent to the area of an 11 in. diameter pipe.

Liquor Spraying.—Cool liquor is continuously sprayed through an easily cleaned nipple down the descension pipe, so that the falling droplets of liquor splash on to the valves in their normal and open position, by which means they are kept scrupulously clean, the interior of the descension pipe is kept wet, and the crude gas is scrubbed and cooled and the descending minute liquid and solid particles precipitated to the maximum extent.

Cooling by Coal Gas.—Cooled and condensed coal gas, under *the pressure* of the exhauster, may be returned to augment the cooling action of the above liquor sprays. The object of this cold supply of gas is to set up a dew-point, and cause rapid condensation within the descension pipe.

Perfectly Free Bench Top.—The gas descending to the subway, the great advantage ensues of a clear bench top—*i.e.*, the foreman need never climb to the bench top to attend to his duties; his work being simplified, and attended to from the ground or stage floor level.

Pipe Augering.—In the past, higher heats meant more trouble-some stopped pipes, so that "Stopped Pipes the Bar to Progress" may in many cases be a truism. In this scheme, pipe augering, the *bête noire* of the retort house, is totally obviated, much to the advantage of the stokers, and to the benefit of carbonization, since higher heats can be employed and bigger yields obtained.

Ammonia and Sulphur.—It is found that, practically speaking, only fixed ammonia is present at the temperatures of the scrubber pipe; the free ammonia only condensing out at the condensers. Hence there is no smell of ammonia whatever. The descension pipe reduces the work for the later purification plant, as the early ammonia washing of the hot crude gases lowers the sulphur content appreciably.

Seal Pot.—There is one seal pot per bed; the descending gases sharply changing direction (up to the foul main) over the surface of the tar in the seal pot, by which means solid particles are induced to precipitate. This pot is cleared daily, which is the work of a few minutes.

Tar and Liquor Main.—All seal pots are connected to the common tar and liquor main by special inclined branches. The main can thus be cleared throughout its length without loosening any flanges or spilling liquor.

Separating Tank.—The tar and liquor main delivers into a separating tank—the tar gravitating to the well, and the cooled liquor being pumped over again for re-use down the descension scrubber pipe.

Capital Expenditure.—The first cost of installation is more than with ordinary ascension pipes on one side of the bench only, but less than the first-cost of a bench with two ascension pipes per retort.

Reduced Centres of Buckstays.—As will be seen, a bed of ten 24 in. by 18 in. retorts can be accommodated in 10 ft. centres of buckstays, which is a considerable saving in first-cost as compared with ordinary benches with two large ascension pipes per retort.

Level-Gauge Working.—There being no seal, there is no inertia to overcome, so that in practice level-gauge condition can be more easily maintained. In this way, degradation of the gas is reduced, and greater yields are maintained.

CONCLUSION.

The foregoing shows that designers of gas-works plant of this description are fully alive to their responsibilities, and are aiming at still higher efficiencies in horizontal retort practice. This increase in efficiency is accompanied by a reduction in operating costs; and this, coupled with the fact that they will carbonize all sorts and conditions of coal, should ensure a continued wide adoption of horizontals.

Radiation from Luminous Flames.

In a paper submitted to the Division of Gas and Fuel Chemistry of the American Chemical Society, and published in the January issue of "Industrial and Engineering Chemistry," R. T. Haslam and M. W. Boyer, of the Massachusetts Institute of Technology, give an account of a study of the radiation from luminous flames of town gas, methane, ethylene, and acetylene. The method employed, however, necessitated the use of small flames, in which there was a difficulty in obtaining a flame that was entirely luminous. The amounts of radiation shown are: Town gas, 9·2 p.ct. of the total heat of combustion; methane, 8 p.ct.; ethylene, 10·05 p.ct.; and acetylene, 28·2 p.ct. Since there was some variation in the composition of the town gas, the results obtained with it are not considered as of special interest. The figures in the first three cases are admittedly low, and would have been higher if a more luminous flame could have been obtained. It was only with acetylene that a small flame could be secured which was entirely luminous. Acetylene is the least saturated gas with respect to hydrogen. The conclusions of the authors are that radiation from a truly luminous flame is at least 25 to 30 p.ct. of the total heat of combustion of the gas. In going from a non-luminous flame to a truly luminous flame, the rate of heat transfer by radiation is increased at least fourfold. With larger flames, this relative increase may even be greater. From a consideration of the results in view of the saturation of the various gases used, it may be concluded that for luminous flames of gases burning with the same amounts of air, the greatest amount of radiation will be given off by the flame of the least saturated gas. Radiation from luminous flames, the authors say, is a very important means of heat transfer—probably a more important means than many engineers have realized. The work done supports the suggestion of Lent concerning the inoculation of non-luminous flames with an illuminating agent—*i.e.*, that the method of inoculation is an excellent one for increasing the rate of heat transfer from non-luminous flames, and will probably find many applications.

The Optical Convention, 1926.—The Convention, which was held from April 12 to 17, 1926, at the Imperial College of Science and Technology, South Kensington, was presided over by the Astronomer Royal of Great Britain, Sir Frank Dyson, M.A., LL.D., F.R.S., and opened by the Prime Minister, the Right Hon. Stanley Baldwin, M.P. The full account of the scientific work is given in the "Proceedings." These two handsome illustrated quarto volumes contain the full text of the Presidential Address and of the papers, numbering nearly one hundred, read at the Convention; with a report of the discussions and of certain special lectures which were given. The publication constitutes a notable record of progress in optical science and instrument design since the previous Optical Convention in 1912. It contains many papers of great importance on the manufacture of optical glass and optical elements, the design of optical instruments of all classes, on colour, photometry and illumination, ophthalmology, astronomy, &c. The price of the two volumes is £3 net; postage 1s. 3d. extra. Publishers: The Optical Convention, 1, Lowther Gardens, Exhibition Road, S.W. 7.

USE OF COKE OVEN GAS FOR TOWN'S SUPPLY.

Discussion opened by E. W. SMITH, D.Sc., F.I.C., before the Midland Section of the Coke Oven Managers' Association at Sheffield, Jan. 26, 1927.

A number of extremely useful contributions have been made to the Technical Press on this matter during the past few years; but the question is of such importance in the cause of fuel economy—and more especially as a means of reducing costs of production in the steel, coking, and gas industries—that I make no apology for again introducing the subject for discussion, even if I can do little more than, in effect, make a re-hash of what has already been said on more than one occasion. To-day there are few gas engineers who question whether or not satisfactory gas can be supplied from well-run batteries of regenerative coke ovens, if the necessary care be taken to comply with their own requirements of supply. I do not consider this last reservation to be a serious one; and where difficulties have occurred, they have been due to a pardonable lack of experience at the coke oven end of gas practice—which would not have arisen if there had been more co-ordination between the two sides.

The subject is a big one; and it is impossible to devise a detailed scheme which would be applicable in all cases. Conditions vary much, both on the coke ovens and at the gas-works; but (before going into detail) there are one or two fundamental questions that will have to be given careful consideration before some gas engineers will give serious thought to the purchase of coke oven gas for town's supply. There will have to be a greater appreciation of, and sympathy for, the obligations of the gas authorities to the public in maintaining an adequate supply of gas made to a definite specification, which is subject to legal enforcement in the event of non-compliance. A coke oven manager may sell his coke to sample, or on his reputation, or to an agreed analysis. At the worst, he will lose a customer in an open market if he fails in his obligations. The gas engineer not only loses his custom, but is often subject to public criticism; and his company may be fined by the Board of Trade for failure to comply. It is consequently not only reasonable, but an essential duty, of the gas engineer to insist on all necessary restrictions in the supply of coke oven gas, if he is to maintain his obligation to the public—all the more necessary as he is responsible for a monopoly in his own area, the consumer having no alternative supply of gas.

UNDERTAKINGS UTILIZING GAS FROM COKE OVENS.

At the present time, the following gas undertakings are known to be taking gas from coke ovens:

Chesterfield Corporation.
Dinnington Gas Company.
Eckington and Mosborough Gas Company.
Glasgow Corporation Gas Department.
Kidsgrove Gas Company.
Leeds Corporation.
Little Hulton Urban Council.
Middlesbrough Corporation.
Ossett Corporation.
Pontypridd Urban Council.
Port Talbot Corporation.
Rhymney and Aber Gas Company.
Rotherham Corporation.
Sheffield Gas Company.
Stocksbridge Gas Company.
Swinton and Mexborough Gas Board.
Wath, Bolton, and Thurnscoe Gas Board.
Wombwell Gas Department.

The experience of most of these undertakings during the coal stoppage was a sorry one, and but for stand-by plant would have been more serious. This strike experience lays stress on the primary consideration in the extended use of coke oven gas in town's supply, which is: What can be done to ensure as great a certainty of maintenance of supply as exists under present conditions, in which the gas engineer has entire charge of his own production in an industry that is less affected by labour troubles than the coal and coking industries?

STAND-BY PLANTS.

Interruptions of supply may be due to the following causes:

1.—Strike at the colliery.
2.—Strike at the coke ovens.
3.—Depression in the coke market, leading the coke oven people to desire to shut-down their coke ovens.
4.—Blockage on the main between coke ovens and gas-works.
5.—Termination of the agreement between coke ovens and gas-works.

Constancy of supply of gas can be assured under the first head, when not accompanied by a strike at the coke ovens, by keeping a sufficient stock of coal—say, four to six weeks' supply—at the coke ovens. This stock would have to be used and renewed at intervals of a few months, in order to preserve the coking properties of the coal.

A strike at the coke ovens can only be dealt with by having a spare plant at the gas-works. Most gas engineers, when using coke oven gas, would consider it necessary to have a complete stand-by plant at the gas-works in first-class condition, ready to be put to work at a moment's notice, not only to deal with temporary stoppage of supply through strikes, but also so that they would not be entirely stranded at the termination of the period of agreement. It is a fact that many of the agreements made years ago, when coke oven operators were willing to accept 4d. per 1000 c.ft., are now terminating; and the coke oven operators, realizing the value of their gas, are only offering to renew agreements at a price many times this figure. Unless the gas undertakings have a proper stand-by in good condition, they are in a very weak position for bargaining with the coke oven operators. This is not a healthy state of things.

Blockage on the main between coke ovens and gas-works has been known, due to supplying crude gas from the coke ovens, which has not been properly free from tar, and which may have contained considerable quantities of naphthalene. This difficulty can be provided for in new contracts.

If the coke ovens are producing domestic coke, then the question of the depression of the coke market is not so important as if the coke ovens were producing a metallurgical coke only.

In the past, gas engineers taking coke oven gas in most cases have kept complete stand-bys in the form of carbonizing plants. These have had to be maintained, and would later on have to be extended. It would, where necessary, be cheaper, from every point of view, to keep a carburetted water gas plant as a stand-by, which would be quicker to start-up. Having a stand-by plant, the provision of the necessary men must be considered. It has been found satisfactory to keep a nucleus of experienced retort house men on the gas-works, who can be turned over to the work of gas making when the time of emergency arises. During the interval, these men have been occupied in selling coke, generally purchased from the coke ovens. It has also been necessary to keep a stock of coal at the gas-works; and, further, in order to preserve the coking and gas-making properties of the coal, this coal has to be renewed every few months. This is generally done by selling the coal for household purposes, and gradually replacing by fresh coal.

The coke oven manager, if he wants to sell his surplus gas, will have to give more thought to what arrangements he can make for the maintenance of his supplies. Can he give the same guarantees as to continuity as the gas-works? It should in some cases be possible.

QUESTION OF COST.

Some coke oven owners appear to have the belief that, if a gas undertaking is selling its gas at (say) 3s. 6d. per 1000 c.ft., it should be able to pay 10d. to 1s. 4d. per 1000 c.ft. for unpurified gas at inlet to the gas-works purifiers, and make a substantial profit. This is by no means the case; and the sooner these gentlemen make a study of the position from the gas undertaking's point of view, the better. The fundamental difference between the two industries, from the point of view of costs, is that, in the gas industry, gas is the main product; and the net difference between all charges, including dividends and the receipts from residuals (bye-products), is met by the receipts from the sale of gas. Variations in the price of gas can be made at the discretion of the gas undertaking; but the undertaking cannot make the progress it desires unless the charges for gas are attractive to the consumer. The coke oven industry has for its main product coke, which stands in relation to the coking industry where gas stands to the gas industry—except that, after determining the remunerative selling price of coke, it has to meet other coke in direct competition.

The ultimate costs in each industry cannot be usefully compared, except to indicate their essential differences. Coke oven gas, supplied direct to steel works, can be sold at a much higher rate—bringing a greater return to the coke oven owner—than it could command from a gas undertaking. Coke oven gas has to bear no capital charges from the coke ovens. It is a bye-product, pure and simple. Gas made on gas-works has to bear all capital charges.

The price it is possible for the gas engineer to pay for coke oven gas is determined, first, by the cost at which he can manufacture gas into the holder on his own works. This cost is made up of the following items:

A.—Cost of coal after deducting value of residuals.
B.—Carbonizing wages.
C.—Works salaries.
D.—Wear and tear.
E.—Purification.

Of these items, when a supply of purified coke oven gas is taken, the wages figure would be reduced by eliminating the exhauster men and the yardmen; these being replaced by the retort house gang for coke selling, as mentioned above. This would probably cut the wages bill by one-third. The salaries bill would also be reduced; but this is generally only a small figure, and need not be considered as altered very much. The purification figure would be eliminated. In place of the wear

and tear item, there would have to be a contribution to a sinking fund, which would provide the money for putting the retort house into first-class order, and replacing it with modern plant, should the coke oven gas supply terminate. This figure would probably, for the first year or two after the coke oven gas supply is commenced, not be very different from the ordinary figure taken for wear and tear; but this can be progressively reduced. This is almost the largest single item in the case of gas manufacture; and the saving effected on this head would enable an appreciable reduction in the price of gas to be effected, irrespective of the cheaper price of gas from the coke ovens.

One other point arises. The gas engineer who takes a supply of coke oven gas would naturally wish to be in as favourable a position as (say) his neighbouring fellow gas engineer, who is making his own gas, to reduce the price of gas, as the price of coal and value of residuals vary. In order to meet this, the gas engineer generally requires to have a sliding-scale, which is based upon the price of coal. Should coke ovens supply unpurified gas, the gas undertaking will have to provide purifiers, holders, and governors to deal with the coke oven gas; and it is often not realized what bearing these charges have on the cost of production of gas.

I have prepared the following table of capital cost figures for a typical gas-works, which gives a good comparative picture of expenses under this head.

Apportionment of the Capital Cost of a Gas-Works. (*Works Only*)

Basis: 4 million c.ft. per maximum day of 200 working days per year.

—	Carbonizing Plant and House.	Purifiers and Shed.	Holders.
Estimated cost.	£116,000	£27,600	£138,000
Percentage of total works cost	25·2	6	30

It will be seen that the holder costs more than the carbonizing plant, although its life is longer.

Gas undertakings must have a renewal fund, which shall provide for the upkeep of plant kept in reserve and also be sufficient for the provision of the most modern type of plant if, and when, necessity arises. In the accounts of most undertakings there will be found a figure of about 7d. per 1000 c.ft., which is the amount put away to such a renewal fund, and is included in works costs.

The Load Factor.

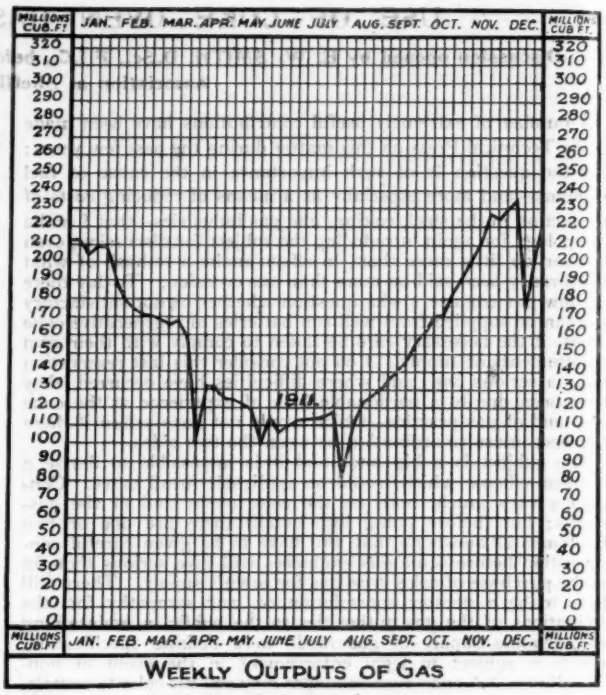
Another matter that a larger gas undertaking has to consider in the utilization of coke oven gas is the question of load. There are daily and hourly fluctuations that are provided for by holder capacity. The usual Sunday morning load is frequently in great excess of the hourly or daily manufacturing capacity of the works, and reserves are accumulated during the week. Sudden fogs or cold weather are sources of sudden increase of output. These demands are supplied from holder stocks, and often from water gas apparatus, and modifications in the manipulation of the carbonizing plants. There are, too, the seasonal fluctuations. The daily midwinter load is often twice the daily midsummer load. The accompanying curve shows this; and it is interesting to note what drops in output occur during Christmas, Easter, Whitsuntide, and August weeks.

If this particular undertaking were to take one-third of its maximum demand as coke oven gas, there would be one week in the year when all the gas making plant on the works would have to close-down, if the arrangements were such that the coke ovens supplied a constant quantity winter and summer. To my mind, this should never be the case, when the quantity of coke oven gas is more than 10 p.ct. of the weekly total output. The coke ovens should feel the effect of fluctuations at least as much as the gas-works plant; and the holder capacity of the combined coke ovens and gas-works should be equal to one day's maximum output. It would often be of advantage for a proportion of the holder capacity to be at the coke ovens.

Coke Ovens and Water Gas Plants.

As to purification of coke oven gas, this can be done at the gas-works if plant is available. If not, then I am of the belief that there are advantages in the gas being purified at the coke ovens. Almost everything depends on whether or not conditions can be so adjusted as to ensure as great a security of supply from the coke ovens as from gas-works. If such security can be attained, I am of the opinion that coke ovens would be well advised to study the problem of water gas production for themselves, which would enable them to provide for town's purposes a gas available for use anywhere en route, which could be put into mains at any desirable point. It would also provide an outlet for surplus coke made at the coke ovens.

I have had prepared some figures which indicate the approximate costs of production of water gas—blue and carburetted—with oil at 4½d. and 6d. a gallon. They indicate that even blue water gas is not cheap to make as compared with coal gas.



WEEKLY OUTPUTS OF GAS

Illustrating the Load Factor Difficulty.

Cost of Manufacture of Varying Qualities of Water Gas.

Basis: 1 million c.ft. per day. Coke at 30s. per ton. All cases self-steaming. *Excluding* capital charges.

Quality of gas, B.Th.U. per c.ft.	B.W.G. 300	C.W.G. 350	C.W.G 400	C.W.G. 450	C.W.G. 500
Cost per 1000 c.ft., oil at 4½d. per gal.	11·24d.	13·1d.	14·95d.	16·69d.	18·43d.
Cost per therm, oil at 4½d. per gal.	3·75d.	3·74d.	3·74d.	3·71d.	3·69d.
Cost per 1000 c.ft., oil at 6d. per gal.	11·24d.	13·85d.	16·45d.	18·94d.	21·43d.
Cost per therm, oil at 6d. per gal.	3 75d.	3·96d.	4·12d.	4·22d.	4·30d.

Distribution.

One of the problems that has to be handled is that of transmission of gas from the coke ovens to the gas-works. What size of mains and what pressures shall be employed? Each case has its own special features; but it may be of interest if I put before you the following figures based on actual experience and known costs. It will be noted that, although no one pressure is the cheapest for all quantities of gas to be compressed, pressures between 10 and 30 lbs. per sq. in. would appear to be the range to be employed. The figures are based on the size of main corresponding with the quantities of gas to be delivered.

Total Cost of Distribution in Pence per 1000 *C Ft.*

(Amortization in 20 years.)

Quantity of Gas, C.Ft. per Day.	Length of Main (Miles).	Inlet Pressure in Lbs. per Sq. In. 5	10	20	30	40
5 Million	5	0·704	0·748	0·870	0·936	1·048
	10	1·074	1·062	1·142	1·199	1·292
	15	1·491	1·425	1·429	1·468	1·554
	20	1·950	1·805	1·766	1·713	1·784
10 Million	5	0·534	0·577	0·700	0·799	0·906
	10	0·782	0·779	0·877	0·953	1·049
	15	1·046	0·989	1·057	1·110	1·208
	20	1·316	1·240	1·149	1·253	1·348
15 Million	5	0·481	0·535	0·663	0·743	0·872
	10	0·678	0·692	0·794	0·854	0·979
	15	0·883	0·866	0·943	0·989	1·093
	20	1·103	1·015	1·090	1·124	1·221
20 Million	5	0·449	0·504	0·625	0·731	0·843
	10	0·609	0·629	0·750	0·827	0·936
	15	0·758	0·779	0·859	0·941	1·028
	20	0·952	0·920	0·980	1·039	1·129

The underlined figures show minimum costs.

Taking a typical example of 2 millions a day, the following

figures show that the cost of distribution is not more than 2d. per 1000 c.ft. for a distance of 10 miles.

Cost of Distribution of Coke Oven Gas.

Basis: 2 million c.ft. per day. C.V., 550. S.G., 0·45 (air = 1).

Therms	11,000 per day	
Distance	10 miles	
Size of main	10 in.	
Inlet pressure	10 lbs. per sq. in.	
Outlet pressure	1 lb. per sq. in.	
Cost of main and laying same	£32,400	
Interest and depreciation	1·6d. per 1000 c.ft.	
	Per 1000 C.Ft. d.	Per Therm. d.
Cost of compression:		
Capital charges (15 p.ct.)	0·148	
Steam at 18d./1000 lbs.	0·310	
Labour	0·103	
Oil, &c.	0·030	
	0·591	0·107
Add capital charges on main	1·600	0·291
Total cost of distribution	2·191d.	0·398d.

NOTE.—This could be reduced if a higher inlet pressure were used, as minimum cost of distribution is obtained in general with low pressures for large volumes and with high pressures for small volumes.

Sometimes one hears that changes in specific gravity may have serious effects on distribution costs, and cause difficulties. It will be seen that, within all practicable town's gas ranges, the effect cannot be more than 2 to 3 p.ct., as expressed by the changes in size of main that would have to be made to maintain the same conditions.

Variation of Size of Main for same Volume, but Varying Specific Gravities.

Specific Gravity (Air = 1).	Diameter of Main, In.	P.Ct. Increase.
0·45	9·5	..
0·50	9·7	2·1
0·60	10·1	5·9
0·70	10·4	9·2
0·80	10 6	12·2
0·90	10·9	14·9

Thus the cost of distribution per 1000 c.ft. would be approximately the same; but the cost per therm (since high specific gravity in general denotes low calorific value) would increase in inverse proportion to the C.V. It is only when distributing producer gas that such difficulties occur, due to the high percentage of inerts; and I believe the majority of gas engineers agree that, whatever calorific value may be the standard employed, the inerts should be as low as is practicable.

Gas engineers, after they have satisfied themselves that continuity of supply is assured, will still require that the gas bought shall be to as close a specification as they themselves adhere. The calorific value of the gas must not vary more than within the prescribed limits. The specific gravity (total inerts) must be constant. The sulphuretted hydrogen in unpurified gas must not exceed a given limit. This last should not be difficult to attain, as crude coke oven gas is usually lower than gas-works crude gas in sulphuretted hydrogen. The gas must be low in temperature leaving the coke oven works, and therefore free from moisture.

DRYING GAS.

One subject which has been occupying the attention of those interested in gas manufacture is the proposition of removing the moisture from gas prior to its distribution. When gas stored over water in holders is subsequently cooled in the mains, condensation takes place. This involves great expense in the installation and maintenance of syphons, and causes irregularities in supply and corrosion of mains, meters, and services. The necessity for the use of cast-iron mains for the distribution of gas is mainly due to the internal corrosion caused by the presence of the water; and with dry gas these mains might be replaced with steel. In addition to this, moisture is of no value, but costs a considerable amount to distribute. A million c.ft. of gas saturated at 70° C. contains nearly 25,000 c.ft. of water vapour.

There are various methods of treating gas for the removal of water, among which may be mentioned compression, refrigeration, treatment by hygroscopic substances, and treatment by adsorbents. Treatment by means of refrigeration may conveniently be carried out by bringing cooled water into intimate contact with the gas. One firm associated particularly with air conditioning—The Carrier Engineering Company—have devised an apparatus for gas cooling along these lines. For small works, ammonia or CO_2 refrigeration would probably be the best; but in large plants the centrifugal type of refrigerating system would appear to be the most convenient. The method of dehydration by means of refrigeration has the advantage that the cooling of the gas also removes naphthalene and tar fog. Gas subjected to this treatment would therefore not require any special naphthalene washing plant.

An interesting suggestion for dehydrating by means of sulphuric acid has been put forward by the Koppers Company of America. The gas is dried by means of sulphuric acid; the diluted sulphuric acid being used on the sulphate of ammonia plant. In this case, a catch box must be employed to prevent any possible entrainment of sulphuric acid. A further scheme for drying gas is by means of silica gel, which has highly adsorptive properties as regards moisture.

One of the most important points to consider is the cost of drying gas; and it appears that this would be somewhere in the neighbourhood of 0·25d. to 0·5d. per 1000 c.ft., according to the quantity to be dried. One of the difficulties to be met is that the gas cooling has to be done on the outlet of the holder, unless the holder liquid is oil. Cooling on the outlet of the holder demands the installation of a plant sufficient to cool the maximum hourly output.

NAPHTHALENE.

Coke ovens must supply gas low in naphthalene. Complete removal is attained in some gas-works. Many get it to as low as 2 grains per 100 c.ft.; and it would be of advantage if all did so. With gas rich in naphthalene, there is a tendency for the naphthalene to be deposited in the mains, causing back-pressure and blockage. When the gas contains light oils, these act as a solvent for naphthalene, and prevent deposition. Naphthalene troubles become a matter of first importance when considering the bulk distribution of coke oven gas. Any blockage of the main increases the power costs of distribution, and is difficult to locate. It is therefore essential that gas to be delivered for town's purposes by coke oven plants should have a low naphthalene content. To maintain a steady, low naphthalene content demands gas washing.

When benzole recovery is obtained by means of wash oil, this at the same time involves a satisfactory removal of naphthalene, as long as certain conditions are watched. When benzole is being washed out by means of a creosote oil, it is possible for the creosote oil to increase rather than reduce the naphthalene in the gas. The following table shows the maximum temperature which must be employed to obtain a gas of desired naphthalene content, when using a wash oil with varying degrees of saturation with naphthalene. Thus, using a wash oil saturated to the extent of 15 p.ct. with naphthalene, if a gas containing 4 grains of naphthalene per 100 c.ft. is required, a

Naphthalene Removal by Creosote.

Table showing Maximum Temperature in ° C. of Wash Oil for Different Degrees of Saturation.

Grains Naphthalene per 100 C.Ft.	P.Ct. Saturation of Oil with Naphthalene.				
	5	10	15	20	25
2	28	17	6	2	..
4	37	29	23	16	10
6	..	34	29	25	20
8	..	37	33	28	25
10	..	40	35	31	28
12	..	..	37	33	31
14	..	..	39	35	32
16	..	..	..	36	34
18	..	..	..	38	30

temperature not exceeding 23° C. must be employed. The efficiency of naphthalene scrubbers depends upon intimate contact between the gas and the wash liquid. In America, the tower type of scrubbers is most favoured. These use small ground space, give little back-pressure, and are simple and cheap to operate. In the Koppers process, a maximum oil consumption of 25 gallons per million c.ft. in summer, and 5 gallons in winter, will reduce the naphthalene and gum-forming constituents to a trace. The loss in heating value of the gas is less than half of 1 B.Th.U. per c.ft.; and the cost of operation of such a plant is very low.

In order to remove all the naphthalene, a more special treatment of the gas is necessary. The South Metropolitan Gas Company have developed a process in which a special fraction of anthracene oil is used for removing the naphthalene. Mechanical scrubbers are employed, and the oil passes in counter-current to the gas through a series of bays in the scrubber. Oil is used to the extent of approximately 20 gallons per million c.ft. The oil is revivified by means of steam distillation; care being taken completely to remove naphthalene from the oil which is used as a washing medium.

If unpurified gas is obtained from coke ovens, guarantees will have to be given that the oxygen content of the gas does not exceed (say) 0·7 p.ct., and less if possible.

Finally, one of the functions of the National Fuel and Power Committee might be to report on the practicability or otherwise of the extended use of coke oven gas for town's supply, and to determine what means can be adopted for maintaining continuity of supplies, and what general principles can, with advantage, be observed in drawing-up specifications and determining prices. Gas engineers and coke oven managers will, I think, agree that efficient further use should be made of coke oven gas in its application to town's supply, if only the two industries would come to grips on the question.

Chemical Engineering Group.

This Group of the Society of Chemical Industry will visit the works of Messrs. J. S. Fry and Sons, Bristol, on Thursday, Feb. 3. Following the visit, there will be a joint meeting with the Bristol Section and the Fuel Section of the Society in the Chemical Department of the Bristol University, when Mr. J. W. Reber and Mr. A. Scott will read a paper on "The Production of Power from Town's Refuse." The authors will give a broad description of the various types of town's refuse, indicating the fluctuations in its nature and composition with locality and season. Town's refuse has a calorific value of from 2500 to 5000 B.Th.U. per lb.; and its moisture content varies between 15 and 40 p.ct. Refuse disposal has always been an expensive item in municipal accounts. Its collection is the primary expense, but after collection its disposal amounts to a high figure. Apart altogether from the æsthetics of the common methods of disposal—namely, dumping on open land, and slow combustion—the fact that this refuse has a usable calorific value amounting to about 25 p.ct. of the value of coal justifies the complete utilization of all town's refuse in the production of power. Some cities burn their refuse in slow combustion destructors connected with Lancashire boilers. This is extremely inefficient, and very expensive in manual labour. The authors will describe the latest type of refuse destructor, each unit of which is capable of dealing with 20 to 24 tons of refuse per day, and producing in the form of electrical energy approximately 150 to 200 KW. per ton, depending on the calorific value of the refuse.

Levelling a Gasholder Tank.

Several years ago, a 5 million c.ft. holder belonging to the Los Angeles Gas and Electric Corporation began to tilt seriously, consequent upon settlement of the soil; and subsequently its condition in this respect became so very bad that it was necessary to raise the tank and framework of the holder several inches off the foundation, to level the structure. Mr. H. L. Masser (the Corporation's Gas Engineer) explains in the "American Gas Association Monthly" that, in order to do this, grooves about 7 in. deep and 12 in. wide by 6½ ft. in length were cut into the concrete foundation under each column, by means of air drills. In these grooves were placed a pair of heavy steel tapered wedges, 4 in. by 5⅜ in. by 5 ft. 6 in. long, having a taper of about 1 in. to the foot. The lower member of each pair of wedges was placed in the groove under the landing beams of the holder. The upper member of the wedge then projecting outwardly was forced in over the lower wedge, as far as possible by that method, by a 50-ton hydraulic jack. To hammer the wedges in to their final position, and to true up accurately the level of the holder, the wedges were driven home with a 1000-lb. battering ram, suspended by cables from the framework of the holder. By this procedure, the tank, and the columns and framework of the holder, weighing approximately 5,000,000 lbs., have been raised to a level position. Inasmuch as the columns and guide rails are carried by the holder tank, these naturally were deflected from their true vertical position with the settlement of the holder tank. The bracing and tie-rods connecting these columns were therefore loosened prior to the raising, in order that the columns might be free to assume a normal position.

Modern Developments in Regard to Fuel.—In view of the great importance of the fuel problem at the present time, the Governors of the Sir John Cass Technical Institute, Jewry Street, Aldgate, London, E.C., have arranged a special course of seven lectures which will deal with some of the technical aspects of the subject. The lectures will be on Monday evenings, from 6 to 7 o'clock, commencing on Feb. 7; and the fee for the full course is 10s. Those during March will be of more particular interest to "JOURNAL" readers—on March 7, "Coke Oven Practice," by Mr. Ernest M. Myers, F.C.S.; March 14, "Gas-Works Practice," by Dr. Harold G. Colman; March 21, "Low-Temperature Carbonization," by Mr. F. S. Sinnatt, M.Sc.(Tech.), F.I.C.; and March 28, "Liquid Fuel," by Prof. J. S. S. Brame, F.I.C.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Steam-Engines for Exhausters.

SIR,—Homeward bound after a long tour, I have been enjoying a belated perusal of your Institution Number—posted to me to Australia—and have read with interest Mr. Rutter's excellent contribution, and your Editorial on the same. I am in agreement with Mr. Rutter in respect of the two points he raises concerning the design of steam-engines for driving exhausters. The diameter and stroke should be dependent upon a fairly constant piston speed. A high-speed engine driving a generator would have cylinders of large diameter and short stroke; but for a slow-speed machine such as an exhauster, the stroke should be long compared with the diameter, to maintain the same piston speed and minimize the wear on brasses, &c.

Again I agree that, for exhausting machinery—often required to run down to (say) 30 p.ct. of its rated capacity—one flywheel of large diameter with suitably designed bearings is desirable to ensure steady working.

The inertia of a flywheel is expressed by the following formula:

$$E = \frac{W \times V^2}{64{\cdot}4}$$

Where E = The energy stored in the rim of the flywheel expressed in foot-pounds.
W = Weight of the rim in pounds.
V = Velocity of the rim in feet per second at a distance from the axis equal to the radius of gyration.

It is therefore obvious that two small flywheels to supply the same inertia would require ponderous rims, with consequent increased downward pressure on the bearings, compared with one flywheel of larger diameter.

The old beam engine referred to by Mr. Rutter—supplied by my firm over sixty years ago—with long stroke and large flywheel is an example of a steady "goer" and long service.

B. B. WALLER
(Messrs. GEORGE WALLER & SON, LTD., Stroud).

R.M.S. "Niagara,"
Dec. 27, 1926.

Confidence in Gas.

SIR,—I was much interested in the letter from Mr. S. Barker Johnson, of Colombo, in the current issue of the "JOURNAL;" and one must admire the splendid results attained in such an unpromising locality.

The three fundamentals mentioned therein are, I am afraid, woefully lacking in the gas industry in this country; and the reason is not far to seek. The policy of ignoring lighting has naturally discouraged the study of that subject, so that the gas industry has to-day very few men who are able to deal with modern lighting problems in a satisfactory manner. This policy is also reflected in the manufacture of lighting fittings. At the moment, I can think of only one firm—I refer to low-pressure fittings now—that does any amount of real designing accompanied by research or testing. How many burner manufacturers can boast of even such a primary necessity as a photometer? Mr. Johnson's second fundamental must be the basis on which any progress in gas lighting can be made, coupled with a reversal of the present policy of letting the lighting slide.

Now, may I make one or two suggestions? Here they are:

1.—Utilize the services of trained illuminating engineers who know what is required, and how to get it.
2.—Abolish gas and air regulators. These contrivances are responsible for more bad lighting (and, I am afraid, language) than anything else. It can be done—with good burners.
3.—Make every effort to find a means of dispensing with the cock and by-pass. It is worth a great deal of expense, if it can be achieved.
4.—I do not see much prospect of any real advance in the efficiency of burners; but further investigation of the size, shape, and composition of mantles might yield useful results.

Gas has many advantages to recommend it—such as reliability (incidentally, while I write this the electric light here has failed for half an hour or so, for the second time in a few days), lower cost, less eyestrain (an important feature), and better ventilation—and it only needs new methods and new fittings to retrieve gas lighting from the unfortunate position into which it has been allowed to fall.

H. STANIFORTH.

5, *Woodland Drive,*
Watford,
Jan. 27, 1927.

Ignition of Oxide in Purifiers.

A correspondent sends us the following extract from the Presidential Address of the late John Methven, delivered before the Institution of Gas Engineers on May 10, 1893: "Another instance of the lack of care in the matter of purification was experienced last year in a rapidly-growing town not an hour's journey from London, when, from over-zeal on the part of the works foreman, an excess of air was drawn in with the gas to such an extent as to ignite the oxide in the purifiers. This being rather rich in sulphur, the latter was transferred into the gasholders. For two or three days, the inhabitants of that town were thoroughly disinfected, especially those who were compelled to burn their gas indoors. The result of the combustion of this gas passed all my experience. I never thought it possible for such an amount of sulphurous acid to be produced. In fact, the only approach to this result obtainable would be by a brazier and a pan of brimstone."

REGISTER OF PATENTS.

Mantle Manufacture.—No. 262,516.

KILBOURN, S., and MARTIN, C. H., both of Leicester, and TERRELL, T., of Temple, E.C. 4.

No. 22,608; Sept. 10, 1925.

This invention relates to the manufacture of incandescent gas mantles, and particularly to the closing-in of the bottoms of inverted mantles and of the heads of upright mantles and securing inverted mantles on their supporting rings. It relates to the manufacture of gas mantles the fabric for which is knitted. The closing-in is effected by the knitting of an additional thread or threads into the fabric; and the process, as regards the various purposes, is described in detail with drawings.

Gasification of Pulverized Fuel.—No. 255,857.

SZIKLA, G., and ROZINEK, A., both of Budapest.

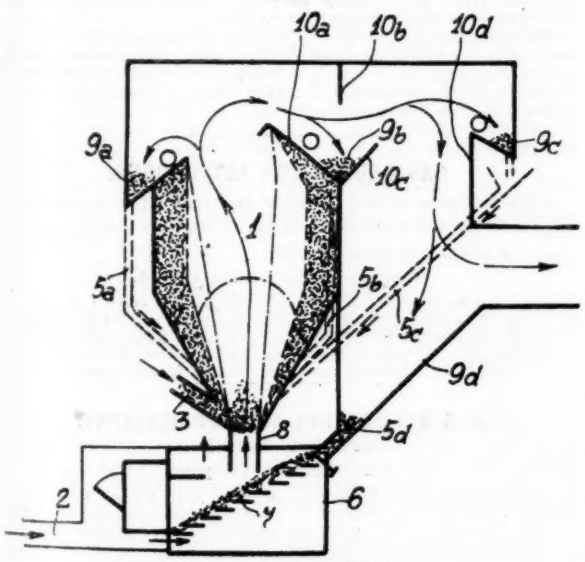
No. 17,582; July 13, 1926. Convention date, July 25, 1925.

This invention relates to the gasification of pulverized coal; and the patentees claim that, by it, it is possible to increase materially the available surface of reaction without decreasing either the size of the dust particles or the time of reaction, so that it is possible to gasify, within a chamber of relatively small dimensions, coarse unsieved coal dust (viz., coal dust of 0 to 5 mm. size) in a suspended state.

To this end, besides the fresh quantity of coal dust which is gasified during its passage through the gasifying chamber, a substantially constant quantity of incandescent coal or coke dust is held in circulation through the gasifying chamber.

The main features of the process will be understood from the following extract, which makes reference to a diagrammatic sectional elevation of an apparatus for carrying it out:

In the diagram 1 is an upright shaft with a draught chamber 6 adjacent to the bottom opening 8 and having a cross-sectional area greater than that of 8; 7 is a step grate. The air is introduced at 2 into the draught chamber 6. Baffle plates 10*a*, 10*b*, 10*c*, and 10*d* are provided, and dust collecting chambers 9*a*, 9*b*, and 9*c* are arranged to receive the dust carried off by the gas; return channels



Pulverized Fuel Gasification.

5*a*, 5*b*, and 5*c* being provided to return the dust to the shaft 1. The fresh coal is fed at 3 into the rising gas current.

The air introduced at 2 may with advantage be preheated by means of regenerators, economizers, or by means of combustion. For this last purpose a certain quantity of fuel can be burnt on the grate 7. The coal dust fed at 3 into the rising gas current is ignited, and will be carried off upwards by the gas current. The velocity of the gas current in the bottom opening 8 is such that even the coarsest coal particles admitted into the shaft cannot break through the air flowing up. The coarser particles are thus kept in suspension, while the finer particles are carried upwardly by the gas current. As the cross-sectional area of the gas current increases, its velocity decreases correspondingly, so that even the finer dust particles are not driven too fast through the shaft, while, owing to the downwardly decreasing cross-sectional area, even the coarsest particles cannot drop. Hence coarse coal dust can be utilized.

To start the plant, a fire is kindled on the grate 7 and a quantity of coal dust is introduced at 3, which is so considerable that only part of it can be gasified with the air introduced at 2 in accordance with the quantity of gas to be produced. The excess of coal dust will be carried off by the gas flow, in a degasified and incandescent state, in the direction of the arrows. The incandescent coke dust carried off by the gas stream is deposited in the dust collecting chambers 9*a*, 9*b*, and 9*c*, and is restored through channels 5*a*, 5*b*, and 5*c* to an incandescent state into shaft 1, in which it meets the rising gas current and is again driven upwardly. The quantity of coal dust fed in at 3 will thereupon be altered to such an extent that only the burnt or gasified part of the stream is replaced, and the quantity of incandescent coke dust flowing back through the return channel is kept constant. The finest and the most burnt dust collected in the last collecting chamber 9*d*, before the gas stream leaves the plant, is not returned into the shaft 1, but is delivered through a channel 5*d* on to the grate 7, on which it is burnt.

Many other features—among them cooling tubes to protect the incandescent coke pockets—are given prominence in the specification.

Thermostat.—No. 263,600.

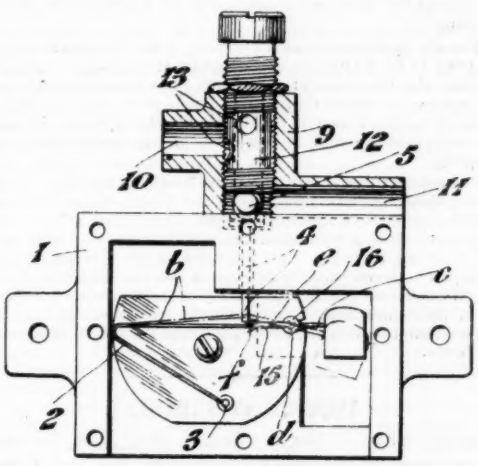
MATTHEWS, A., of Brighton.

No. 29,957; Nov. 27, 1925.

This invention relates to a thermostat for regulating the supply of coal gas or other fluid to a burner or burners on a heating unit, and has been devised particularly for use with gas-heated retreading and vulcanizing plant.

The feature of the invention is the **V**-shaped sensitive rod, as will be clear from the following extract, and part-sectional elevation which we reproduce.

The casing 1 accommodates a strip of mild steel or other suitable flexible metal 2 which is bent substantially **V** shape; the extremity of one limb *a* being connected to a fixed point 3, and the extremity of the other limb *b* being connected to a movable point and supporting a vertical spindle 4 upon the upper end of which rests a valve closure member 5. The casing 1 comprises a hollow rectangular casting of aluminium having a packed lid. Extending vertically from the centre of the top side of the casing is a hollow cylindrical extension 9 having in its side a gas inlet 10, and on a diametrically opposite point a gas outlet passage 11; the two passages being in different horizontal



Matthews' Thermostat.

planes. Threaded into the cylindrical extension 9 is a hollow sleeve 12 having holes 13 in its side adapted to register with the gas inlet 10; an opening at the bottom of the sleeve allowing gas to flow into the outlet passage 11. The bottom of this sleeve 12 is formed with a seating adapted to receive a ball valve comprising the closure member 5, which normally clears such seating by gravity and rests upon the head of the vertical pin 4 slidably passing through the base of the cylindrical extension and resting upon the movable end of the **V**-shaped strip 2. By threading the sleeve into or out of the cylindrical extension, the movement necessary for the ball valve to reach the seating on the bottom of the sleeve can be finely adjusted.

The extremities of the **V**-shaped strip are disposed one above the other, and the apex or point of union of the limbs *a*, *b* engages a fixed abutment. Consequently, if heat is applied to the strip, it will expand, and the movable end will gradually rise and ultimately seat the ball valve.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Jan. 26.]

Nos. 1304—1988.

ANDREWS, C.—"Compound sealing device for controlling flow of gases." No. 1906.

BROADHEAD, R. W.—"Regenerator settings for manufacture of gas." No. 1324.

BROADHEAD, R. W.—"Producers for heating carbonizing plant." Nos. 1325, 1326.

DEMPSTER, LTD., R. & J.—See Andrews, C. No. 1906.

FROHLICH, O.—"Handling coke." No. 1610.

HARVEY, C. H.—"Device for indicating escape of gas." No. 1576.

MITCHELL, G. P.—"Gas fires." No. 1684.

NAAMLOOZE VENNOOTSCHAP SILICA EN OVENBOUW MIJ.—See Frohlich, O. No. 1610.

OTWAY, F. S.—"Gas fire." No. 1497.

ROGERS, R. J.—"Ventilators for flues." No. 1430.

SELAS AKT.-GES.—"High-pressure gas burners." No. 1847.

WHITTLE, C.—See Harvey, C. H. No. 1576.

WOLFF, F.—See Selas Akt.-Ges. No. 1847.

MISCELLANEOUS NEWS.

SOUTH METROPOLITAN AND SOUTH SUBURBAN GAS COMPANIES.

Proposed Working Agreement.

Published notices by the South Metropolitan Gas Company and the South Suburban Gas Company intimate that the ordinary general meetings (which are to take place on Feb. 23 and Feb. 25 respectively) will be followed by extraordinary general meetings, to consider an agreement between the two Companies which has been entered into under the South Metropolitan Gas Act, 1925.

The agreement is subject to the approval of the Board of Trade, and its main object is to provide for a supply of gas in bulk by the South Metropolitan Company to the South Suburban Company for a period of twenty-five years or more. The agreement also provides:

(*a*) For the use of the South Metropolitan Company's landing stage at East Greenwich for the unloading of coal for the South Suburban Company.

(*b*) For the analysis by the South Metropolitan Company of samples of coal landed at such landing stage for the South Suburban Company.

(*c*) For the exchange of South Suburban ordinary stock by the holders thereof for 6 p.ct. irredeemable preference stock of the South Metropolitan Company up to a nominal amount of £500,000, with the proviso that if such exchange cannot be effected the agreement is to become void.

(*d*) On the occasion of any future issue of capital by the South Suburban Company, for the issue of a certain proportion of such capital to the South Metropolitan Company or for the exchange of a certain amount of such capital by the holders thereof for stock and securities of the South Metropolitan Company.

(*e*) For the appointment of a Director of the South Suburban Company to be a Director of the South Metropolitan Company, and that the Directors of the South Suburban Company shall endeavour to secure that three persons from time to time, nominated by the Directors of the South Metropolitan Company for that purpose, shall be Directors of the South Suburban Company.

(*f*) For payment by way of compensation by the South Metropolitan Company to any Director of the South Suburban Company, who, after the approval of the agreement by the Board of Trade, desires by reason or in consequence of the agreement to vacate his office as a Director of the Company, of a sum equal to seven years' purchase of his annual fees. Two of the Directors of the South Metropolitan Company are Directors of the South Suburban Company, and as such would be in a position to avail themselves of this provision, should they so desire.

INQUIRY AT SKEGNESS.

Difficulties which, through inadequate plant, have for some time been experienced in connection with the Skegness Gas-Works, have led the Urban District Council to embark upon a scheme of extensions involving an application—which formed the subject of a public inquiry, on Jan. 26, by Mr. F. L. Gordon, an Inspector of the Ministry of Health—for leave to borrow £16,771 for the installation of new plant. During the proceedings there was a heated protest by Mr. H. Wheatley, who is in business in the town as a gas-fitter; his contention being that Skegness ratepayers had not been receiving value for money spent upon the gas undertaking.

The new plant for which the greater portion of the money is to be borrowed includes vertical retorts at a cost of £13,267; it being estimated that the additional loan charges of £1271 will be more than met out of the increased sales of gas and the saving in working costs.

Dr. Sweeton, Chairman of the Gas Committee, explained that the Council had carefully considered the question of coping with the increased demand for gas, and had arrived at the conclusion that new plant was necessary.

The policy of the Gas Manager was criticized by Mr. Wheatley, who suggested that no individual member of the Council was likely to spend £10,000 of his own money merely upon the advice of one person.

In reply, Dr. Sweeton observed that, though the Council had indeed acted solely on the advice of their Gas Manager, the members were not devoid of common sense.

After the inquiry, the Inspector made a detailed inspection of the works.

Compensation Case at Blackburn.—At the Blackburn County Court, on Jan. 17, William Moulding claimed compensation from the Corporation. The applicant said he had been employed at the gas-works 36 years, and received £2 13s. 8d. weekly. In November, 1925, he was lifting lids off the purifiers, when the crane handle struck him on the head, rendering him unconscious. He was in bed fourteen days. Until Nov. 13, 1926, the Corporation paid compensation of £1 6s. 8d. weekly. In April applicant tried to work, but the foreman sent him home as he could not do it. Counsel said the fact that the applicant had been employed by the Corporation 36 years did not suggest he was a man likely to shirk his work. His Honour held that the applicant was not totally incapacitated. He awarded compensation of 19s. 6d. weekly, with costs.

YORKTOWN AND BLACKWATER GAS COMPANY.

Dividends of 12½ p.ct. and 8⅝ p.ct. on the original and additional shares respectively (including the interim dividends already paid), both less income-tax, were recommended by the Directors of the Yorktown and Blackwater Gas Company at the annual meeting held at Blackwater, on Wednesday, Jan. 26—Alderman D. SPARVELL, J.P., presiding. The report stated that the working profit on the gas and electricity undertakings amounted to £10,557, after providing for depreciation.

The CHAIRMAN said he was sure the shareholders would consider the results very satisfactory, in view of the difficult conditions. The Company on May 1 last had approximately 3000 tons of coal (twelve to fourteen weeks' supply) on the works. When the end of this stock was in sight, there was no alternative but to look round for foreign coal; and he was glad to say that, owing to foresight and activity, the Company were able to obtain comparatively steady deliveries week by week, and thus give an unrestricted supply of gas to the consumers during the whole of the strike—for the first five months, at the pre-strike price. Though the strike had been over some seven or eight weeks, the Company had received very little English coal; and they were still using coal costing from 70s. to 80s. per ton, or over 120 p.ct. above normal prices, and supplying gas at an increased price of 1½d. per therm, or under 11 p.ct. above the pre-strike price. The total sales of gas showed an increase of about 9 p.ct.; and this, of course, was in face of rapid development of the electricity undertaking, which showed a 78 p.ct. increase.

The Directors were of opinion that the electricity part of the undertaking would be on a dividend-earning basis at the end of the present year, providing no unforeseen circumstances arose. This was very satisfactory, in view of the fact that this branch of the undertaking would then be only six years old. It would be noted from the capital account that considerable extensions on the district had been carried out, in both gas and electricity, to meet demands for new supplies, which continued to come in. The area was developing tremendously; and the Directors looked forward to a very prosperous future. It was proposed shortly to issue further capital.

The report and accounts were adopted; and the dividends recommended were declared.

The Directors were thanked for their services, and their remuneration was increased to 600 guineas a year.

The CHAIRMAN, proposing a hearty vote of thanks to the staff, said that no one could work harder for, or take more interest in, the undertaking than did Mr. H. J. Randall, the Engineer and Manager; while Mr. H. G. Hards, A.C.I.S., the Secretary, was also doing excellent work for the Company.

GAS REGULATION ACT ORDERS.

There has been received from the Director of Gas Administration a copy of the following Order made by the Board of Trade under section 1 of the Gas Regulation Act.

Thornton Urban District Council.

After the declared date, the maximum price in respect of gas supplied by the undertakers shall be 12·6d. per therm. The charges to be made for the hire of prepayment meters and fittings are inserted.

The Order came into operation on Jan. 24.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDERS.

East Hull Gas Company.

To extend the limits of supply; to make provision for a basic price for gas and basic dividends; to empower the Company to borrow further money; to authorize agreements or arrangements between the Company and other gas undertakers; to provide for the satisfaction of any consideration payable by the Company or by such undertakers by shares, stocks, or securities; and to confer powers on the Directors of the Company to appoint Directors or representatives of such other undertakers additional Directors of the Company.

Richmond (Yorks.) Corporation.

To extend the limits of supply; to authorize the Corporation to construct works, &c., on scheduled land; to make further provision for regulating the undertaking; and to authorize further borrowing.

Tiverton Corporation.

To establish the thermal basis of charge; to increase the maximum price of gas from 4s. 6d. per 1000 c.ft. to 15d. per therm; to authorize the Corporation to borrow further money; to make new provisions as to the application of the revenue of the undertaking; and for other purposes.

ORDER UNDER SECTION 1.

County Borough of Warrington.

The maximum price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 2·4d. per therm.

It is also proposed that the existing rates of discount and for additional mileage charges in respect of gas supplied beyond the borough be altered to a corresponding rate per therm.

The Holyhead Gas Company, in reply to a communication from the Llanfairfechan Council, state that they cannot promise any immediate reduction in the price of gas.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

Report of Annual Shareholders' Meeting.

The Annual Meeting of the proprietors of the Aldershot Gas, Water, and District Lighting Company was held at Farnborough on Monday, Jan. 31—Mr. R. W. EDWARDS, Chairman and Managing Director, presiding.

The SECRETARY (Mr. F. A. Ricketts) read the notice convening the meeting; and after the minutes of the previous ordinary meeting, and of an extraordinary meeting held in April last had been confirmed, the CHAIRMAN rose to move the adoption of the Directors' report and accounts for 1926. The report was as follows:

DIRECTORS' REPORT.

The Directors present a statement of the Company's accounts for the year ended Dec. 31, 1926, from which it will be seen that the revenue from all departments was £244,312 6s. 7d., and the expenditure £204,463 5s. 5d., leaving a surplus of £39,849 1s. 2d.

After allowing for dividends on consolidated preference stock, interest paid to bank, and on redeemable mortgage bonds and debenture stock, as well as for the statutory dividends paid for the half-year ended June 30, 1926—viz., £5 13s. 6d. p.ct. per annum on the "A" stock, £4 3s. 6d. p.ct. on the "B" stock, and £5 p.ct. on the "C" stock—the Directors recommend the full statutory dividends of £5 p.ct. on the "A" stock, £3 10s. p.ct. on the "B" stock, and £5 p.ct. on the "C" stock for the latter half of the year, all less income-tax. The standard price of 17·4d. per therm, fixed by the Board of Trade in March, 1921, was amended last April to 14·4d. per therm; but in consequence of the effect of the prolonged coal strike, it has been increased temporarily by the Board of Trade by 1·8d. per therm to Dec. 31 next. This revised standard of 16·2d. per therm will permit higher dividends being paid on the "A" and "B" stocks for the current year.

The year 1926 will be notable for the great upheaval, commencing May 1 caused by the simultaneous general strike and coal stoppage; the latter continuing a matter of six or seven months.

The Directors record with appreciation, first, that all employees remained loyal to their duties, and, secondly, that notwithstanding the difficulties in obtaining large quantities of coal from the Continent and the United States, of very varying qualities, the gas supplied over the many districts by this Company has been maintained at its full statutory quality. The standard to which the Company works is 525 B.Th.U. per c.ft.; and the average over the twelve months, as certified by the Official Examiner on behalf of the Surrey County Council, and by the Official Examiners on behalf of four Local Authorities, was 526·3 B.Th.U.

The Gas, Water, and Electricity Undertakings show satisfactory progress in all departments. During the last four years a considerable programme of works reconstruction and extensions has been in hand, and will, it is hoped, after the end of 1927, substantially draw to a close.

Mr. Lionel Maltby, F.C.A. (of Messrs. Deloitte, Plender, Griffiths, & Co.), retires by rotation, and is willing to serve again if re-elected.

The retiring Director is Mr. T. A. Braddock, who, being eligible, offers himself for re-election.

R. W. EDWARDS, Chairman.

THE CHAIRMAN'S ADDRESS.

The CHAIRMAN said: In submitting the Directors' report and accounts for the year 1926, I would presume in the first place to anticipate your permission to take the same as read. The first portion of my address to you will be confined to our premier department

GAS.

The outstanding feature of the remarkable twelve months of 1926 will be placed in history as the great general strike, which so ignominiously failed of its purpose, and which commenced and ran simultaneously for a short period with the coal strike. The latter went onwards for seven to eight months, with the stoppage of coal production in all British mines.

We have already placed on record appreciation of the loyalty of our employees, and also our pride in the efficiency of our technical and manufacturing staff, who maintained, under these trying conditions, the full standard quality, purity, and pressure of gas at all our many districts, notwithstanding the manifold difficulties arising when drawing unknown coal from various foreign countries. This great effort on the part of our Company will be one of many magnificent services provided by the great gas industry to the nation at large. I hope that the general public throughout the country will long remember how well they were supplied with the necessary heat for obtaining warmth for their homes, and for cooking their food during the long period when practically no coal was available for domestic purposes.

The gas industry has furnished these wonderful facilities to the public without abnormal profit to themselves; but I fear these supreme efforts have been very much less appreciated in cases where undertakings were unable to maintain their service. It is a tragic thought (happily inapplicable in our case) that all one's endeavours are sacrificed; and goodwill is lost, after such a supreme service, by unavoidable inability to maintain the full quality and pressure; for it is during such times as a great coal strike that one aims at helping the public and maintaining a high reputation, and so retaining goodwill and patronage afterwards. We have always endeavoured to carry out this policy, and we find it pays in the long run; for our consumers remain loyal after great upheavals, knowing from experience how beneficial and necessary in times of stress is a good gas supply, which, during normal times, becomes almost a necessity of life.

Perhaps I am unduly dwelling on this point, but it so happens that our Gas Department has, since the termination of the war in 1918, passed through a period of uncontrollable depression, thus necessitating the exploring and opening-up of new fields of business. This Company has always fully co-operated with the military in times of war, but the penalty is an inevitable contraction of business on the cessation of hostilities. As an illustration, in 1918 our works output of gas, on a 450 B.Th.U. basis—the quality then supplied—was 548,451,000 c.ft. This steadily dropped over subsequent years, but, on the same equated basis, I am pleased to say, has risen during 1926 to 612 million c.ft. The expansion in this department is sure proof that we are rebuilding our business on a broad and sound foundation; and we are hopeful that our delivery of gas will reach 1000 millions in about five years.

Now these results are not being achieved by armchair methods, but through a virile campaign, conducted by our sales department. We have added the following apparatus during 1926:

Cookers	639
Fires	851
Hot water appliances	258

which compares favourably with 1925, notwithstanding the fact that for a considerable period of the strike the hiring of new apparatus had to be entirely suspended.

The increased sale of gas for the year was nearly 8 p.ct. (7·7 p.ct., as compared with 6·8 p.ct. for 1925 and 12·5 p.ct. for 1924), making a net increase for three years of about 30 p.ct. (29·72 p.ct.). This is a most gratifying result, having regard to the fact that during eight months of strike a number of our industrial consumers were limited, by Government Regulations, to 50 p.ct. of their normal consumption, besides the advocation of strict economy on the part of domestic and commercial consumers.

Residuals somewhat recovered since 1923, though in that year the amount received from this source represented 75·5 p.ct. of the cost of coal, as compared with 66·8 p.ct. in 1926.

Undoubtedly the high cost of coal, purchased in consequence of the strike, has inflated our expenses, and will continue to do so, because, unfortunately, by reason of the unsettlement of the coal world, we were compelled, like many other gas undertakings, to contract ahead over Christmas and for some period into the new year, in order to safeguard our manufacturing arrangements. The highest price paid for coal was as much as 150 p.ct. above the average of 1925, while the price of gas was only increased by 14·28 p.ct. I do not think it will interest you to have any more details of the large tonnage of coal purchased, or the amount of money involved for other necessary things—such as gas oil, and coke from outside sources—but the bill has been between £60,000 and £70,000. In these purchases cash down on delivery has been the order of the day, whether one received the quantity or quality or not; in fact, our experience has been that in several cases we did not receive the quantity invoiced or the quality anticipated.

Before I conclude my remarks on this department, it is a matter of interest to record that, notwithstanding all these varying conditions of 1926, with different classes of coal—good, bad, and indifferent—the net yield of coke and breeze saleable represents 13·8 cwt. per ton of coal carbonized, while the liquid products, with ammoniacal liquor on an 8-oz. basis, including tar, represents 43·9 gallons per ton of coal carbonized.

I do not think I can add anything further of interest to the affairs of the Gas Department, excepting to say that the Directors are cognizant of the importance of reducing the price of gas as early as possible; but I do not think that any reduction can take place until midsummer, when the extent will be a matter for careful consideration, having regard to the commitments of the Company, and its financial position, which are essential factors in the efficient carrying out of such a big undertaking.

WATER.

This Department progresses steadily. We have pursued a conservative policy of maintaining our plant and all other apparatus and mains in an efficient condition. There has been an increase in the revenue from the sale of water, but, unfortunately, the same has been more than counterbalanced by increased expenses.

It is a high and well-deserved tribute to our water inspectors that the net domestic consumption per day per head of the population, for 1926, was 15·81 gallons. This also indicates that the public are still co-operating in maintaining their fittings in good condition, and avoiding waste of water, which care we much appreciate.

The bedrock of this great Military Centre must be at all times the provision of an inexhaustible supply of pure water. We have considerable obligations to the War Department in this respect, as well as to a fairly big civil area. For over sixty years we have been statutory water undertakers, and for a large portion of that period have continuously supplied the Military Camp at Aldershot, alike in drought and plenty. Our pumping stations are ready at all times to respond to the extraordinary demands of H.M. Government.

ELECTRICITY.

This Department records a net increase, apart from special contracts, in the sales for 1926, of 21·7 p.ct. The output of electricity is now advancing rapidly, and it is anticipated that we shall soon exceed two million units per annum. Thereafter we must strive for a five million output, and so justify, as soon as possible, our special scheme of generation, which will, in our opinion, owing to the unique facilities we are developing, compare most favourably in efficiency and economy with any station in the South.

I have been asked to make reference to the repeated statements appearing in the local Press with regard to schemes of concentration, &c., which are rather inclined to give our consumers and shareholders an impression that the Company's statutory powers and districts are likely to be merged into some other authority. We have now held statutory powers over many parishes for nearly twenty years, and, instead of relinquishing our business, we are actively engaged in

further developments. A clearly conceived policy of generation and distribution has been followed throughout, and with it a real conception of what Parliament expected us, as a composite undertaking, to do—in regard to serving not only the districts within our statutory limits of supply, but beyond our districts to others in large bulk quantities.

CAPITAL.

Following my previous practice, I now deal with a statement as to our capital. For the three undertakings, the amount of capital authorized is £1,056,367 14s. 2d. Of this there has been received £775,775 4s. 5d. Adding the debit balance of £26,304 13s. 10d., we arrive at a total of £802,079 18s. 3d., from which £40,989 8s. 3d. (having been added on consolidation, in 1909) is deducted to arrive at a net figure of £761,090 10s.

After deducting depreciation, of £8398 12s. 7d., the net expenditure for the year 1926 was £85,322 16s. 4d., and of this latter sum there has been spent on the following departments:

Gas	87·7 p.ct.
Water	4·6 "
Electricity	7·7 "

or again, further analyzing the expenditure under the heads of the various works:

Lands, new buildings, and works	80 8 p.ct.
New mains and services	14·4 "
New meters	3·5 "
Machinery	0·8 "
Transformers	0·5 "

As mentioned in the report, our heavy extensions are now drawing to the concluding stages. The reconstruction and enlargement of the gasholder at Fleet has been completed; the reconstruction and extension of the retort houses is drawing to a close; the new 3-million c.ft. gasholder at the North Works, Ash Road, will be ready for use in the early autumn; while the extensions at the chief office are now practically complete and in use.

GENERAL.

We have added a total number of consumers for the year of 1010, as against 830 for 1925, and 1430 for 1924—a total of 3270 consumers, of all classes, over three years. It is anticipated that this figure will be increased during 1927 to 5000 additional consumers, added in four years.

In closing my speech last year, I referred to the revision of the standard price, which would have the effect of reducing the dividends on the "A" and "B" stocks. An explanation has been given of this in the Directors' report accompanying the balance-sheet; and I can only add this—that it is most unfortunate that this revision was applied for at a time when the residual market was extremely depressed, and, furthermore, that the revised standard was introduced almost on the eve of the coal strike. There has been no advantage to the public, while the disadvantages are that the "A" and "B" shareholders have suffered a drop in their modest statutory dividends, and the co-partners a diminution in their bonus from 10 p.ct. to 3½ p.ct. This latter is very much deplored, having regard to the general feeling throughout the country on the wisdom of encouraging this system of interesting employees in the welfare of large businesses, and at the same time enabling them to improve their conditions in life. The Board of Trade have, however, granted a temporary increase in the standard price to the end of 1927, as a set-off against the unavoidable increase in expenses caused by the coal stoppage.

A point to which I think one might make special reference is that revision of the standard price—controlling the dividends on ordinary stocks—is extremely important, because when frequently resorted to it unbalances the entire market value, and prohibits the issue of certain classes of new capital. In pre-war days the question of the revision of a standard price was rarely known; but with a change of circumstances, brought about by the war, this privileeg was introduced, as being applicable both to the Public Authorities and to the Company. I fear that unless there is some stabilized dividend on which intending investors can base their purchases, there will not be the same value paid for new stocks as has previously been the case in undertakings of this character. In fact, as I have said, I am of opinion that frequent interference with the standard price will, as it has in this Company's case, make the issue of new sliding-scale capital absolutely prohibitive, thus hindering the raising of cheap capital, which is so essential to the economical operations and progress of a public utility undertaking.

There is just one other point in which, I think, reference can justly be made, and that is that the dividends on these stocks have not been extravagant. As an illustration, the average dividend from July 1, 1914, to Dec. 31, 1926, on the "A" stock, was £5 12s. p.ct., and on the "B" stock, £4 2s. p.ct., as compared with pre-war dividends of £6 4s. and £4 14s. p.ct. respectively. When you think of the difference in the value of money to-day, and the huge deduction by way of income-tax, you will agree with me that the present rate of dividend to the "A" and "B" shareholders is not attractive.

We have had to consider the question of our assessments in the various Unions. This undertaking is, perhaps, exceptional, inasmuch as it is the only concern upon which Parliament has, so far, thought fit to confer powers for the production and distribution of all three commodities—gas, water, and electricity. This Company has a statutory area of 153 sq. miles, and operates in no less than three counties, five assessment unions, and 22 different parishes. It is, therefore, a very important matter that the assessments in the various unions should be closely scrutinized, because there is undoubtedly the tendency for the sum of those various assessments to exceed the total valuation placed on the undertaking for rating purposes. It has, therefore, been a matter for grave consideration that these things should be examined by our advisers, and certain courses have had to be taken in the interests of the undertaking. I am unable to deal any further with this subject, because it is *sub judice*. But this much I can say: We are convinced that there is some room for improvement in the law in relation to the assessment of special properties, and I have no doubt that at the proper time the responsible authorities will bring this to the notice of the appropriate Government Department.

In conclusion, the Directors pay tribute to the whole of the employees and officials of the Company in general, and to the three principal officers—the Chief Engineer, the Chief Accountant, and the Secretary. Our Accountant had produced his balance-sheet in good time for the annual meeting to have been held even earlier than in 1926, and so has broken all records. In the Secretary's department, the dividends were also ready to go out, but for unforeseen reasons we had to delay matters a little, and our meeting is two or three days later than last year. It is very gratifying to the Directors to know that a real cordial feeling exists in all ranks in every department, and a genuine desire to further the interests of the Company, with a view to making its service to the public a perfect one.

On the other hand, the Directors have left no stone unturned to advance such schemes as co-partnership, sports grounds, benevolent and hospital funds, and in supporting convalescent homes, to which employees are sent when recovering from illness. By these means there is an appeal to the humane side of life, which undoubtedly can have only a good result.

I have much pleasure in now formally moving: "That the Directors' report with the statement of accounts for the twelve months to December 31, 1926, be and are hereby adopted, and that the dividends as therein recommended be and are hereby declared to be payable to the proprietors on the 1st day of March, 1927."

The DEPUTY-CHAIRMAN, Mr. Thomas A. Braddock, seconded the motion, which was unanimously adopted.

Mr. Braddock was re-elected a Director; and Mr. Lionel Maltby, F.C.A., Auditor of the Company, was re-appointed.

The meeting terminated with a vote of thanks to the Chairman, Directors, and staff, to which Mr. EDWARDS and Mr. RICKETTS responded.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Jan.* 31.

Pitch continues quiet, and the price is nominal at about 120s. per ton in bulk at makers' works.

Creosote is steady at about 9d. per gallon net in bulk.

Tar spirits continue in demand; pure toluole being about 2s. 6d. per gallon, pure benzole about 2s. 3d. per gallon, and 95/160 solvent naphtha about 1s. 11d. to 2s. per gallon.

Crystal carbolic acid is unchanged at about 6½d. per lb. in large drums and overcasks.

Tar Products in the Provinces.

Jan. 31.

The average values for gas-works products during the week were: Gas-works tar, 80s. to 85s. Pitch, East Coast, 110s. to 115s. f.o.b. West Coast—Manchester, 107s. 6d. to 112s. 6d.; Liverpool, 110s. to 114s.; Clyde, 112s. 6d. to 115s. Benzole, 90 p.ct., North, 1s. 9d. to 1s. 10d.; crude, 65 p.ct. at 120° C., 1s. 2½d. to 1s. 3d., naked at makers' works; 50-90 p.ct. naked, North, 1s. 10d. to 1s. 11d. Toluole, naked, North, 1s. 8½d. to 1s. 9½d. nominal. Coal-tar crude naphtha, in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 4½d. to 1s. 5½d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 7½d. to 7¾d.; salty, 7½d. to 7¾d.; Scotland, 7½d. to 7¾d. Heavy oils, in bulk, North, 8¾d. to 9d. Carbolic acid, 60 p.ct., 1s. 8½d. to 1s. 9½d. prompt. Naphthalene, £11 to £14; salts, 100s. to 110s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Manchester District Tar Prices.

The average price realized for the sale of tar in the Manchester district, according to the sliding-scale, for the month of December was £5 1s. 10·45d. per ton.

Workmen's Annual Dinner at Reading.—The workmen of the Reading Gas Company held their annual dinner on Saturday, Jan. 22. In the absence of Mr. D. H. Helps, the Engineer and Manager of the Company, Mr. L. A. Rumble, the Assistant Engineer and Manager, presided. Mr. C. H. Eves, in proposing the toast of "The Chairman and Directors of the Reading Gas Company," said that all realized that the Directors had the welfare of their employees at heart. The spirit which prevailed between employers and employed in the Company ought to be fostered in every industry. Mr. Rumble, in the course of his reply, said that this was the first occasion during 23 years that Mr. Helps had been absent from their annual dinner.

Accident at the Tottenham Gas-Works.—Last Thursday week, following a number of complaints from the district, it was found that one of the purifiers in the vertical retort section of the gas-works in Willoughby Lane of the Tottenham District Light, Heat, and Power Company was allowing sulphur compounds to go forward; and the portion of the plant involved was immediately shut-down. On the following Monday, when workmen were engaged in opening-up the box in which the trouble had started, a large burst of flame followed the removal of the lid, and a number of the men were burned on the face and hands. The local fire brigade was called upon, and subsequently the chemical fire-extinguishing apparatus at the headquarters of the London Fire Brigade was sent for. Immediately the trouble with the sulphur compounds in the gas arose, the Company sought the aid of Dr. Harold G. Colman in arriving at the cause of so unusual an occurrence. Until the receipt of his report, nothing definite can be said as to the origin of the trouble.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

There was not much change last week in quoted prices, and there was also no improvement in the general demand. The position now is that prices all round have shown a steady decline ever since the general resumption of work, and are now something like 6s. a ton lower than they were in the middle of December. In the circumstances, it is not surprising that buyers have been satisfying nothing but their spot requirements. It is felt that a few weeks' stability might bring on new business, and give collieries an opportunity of fixing up some much-needed contracts. This stability is now considered to be nearer, because many producers are undoubtedly reaching a stage where market prices leave no margin over costs. The effects of the strike underground are still being felt, and production costs are perhaps not quite at the bottom, but, on the other hand, any reduction in these will mean increased quantities to market.

The recent strength of coking coal has not been fully maintained, and demand for gas coals is still extremely slack. It is hoped, however, that shipments to south country gas-works under old contracts will soon increase, and help the position in this respect.

Wear Special gas makes are quoted at 18s. 6d. f.o.b., and best qualities at 18s.; but these are nominal prices, and cannot be obtained for actual business. Seconds are 15s. 6d. to 16s. 6d. f.o.b. Durham coking is 17s. to 17s. 6d., and some qualities have been done at 16s. 6d. for prompt shipment. Best bunkers are obtainable at 16s. to 17s.

Gas coke for shipment is quoted at 23s. f.o.b., and foundry at 24s. to 25s.

YORKSHIRE AND LANCASHIRE.

Gas coals in Yorkshire and Lancashire are normal, with contracts, generally speaking, up to date. Outside parcels are offered at figures in some instances a little below contract.

Collieries still complain about a serious shortage of empties, and also of delays in disposing of loaded traffic. Efforts have been made in various directions to remedy this state of things, but so far with little or no success. As a result, many collieries are compelled to work short time.

The demand for house coal is not brisk; but the better grades maintain their value. The industrial situation is not improving as rapidly as was anticipated, and many of the "key" industries are still on short time and appear likely to be so for many months to come. There are indications, however, that the iron and steel section will be moving more quickly in the next month or so.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 22s. 6d.; screened gas coal, 24s.; washed doubles, 25s. to 25s. 6d.; washed singles, 21s.; washed smalls, 16s. 9d. to 17s. 6d.; rough slack, 14s.; smithy peas, 24s. to 27s. per ton. West Yorkshire—Hards, f.o.b. Goole, 21s. to 23s.; screened gas coal, 23s.; washed doubles, 22s.; washed singles, 21s.; washed smalls, 13s. 6d. to 14s.; unwashed doubles, 19s.; rough slack, 14s.; coking smalls, 11s. 6d. to 12s. per ton. Derbyshire and Nottinghamshire—Top hards, 22s. 9d. to 25s.; washed doubles, 23s. to 23s. 6d.; washed singles, 21s.; washed smalls, 15s.; unwashed doubles, 19s. to 20s.; rough slack, 13s. 6d. to 14s. 6d. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Unscreened steam coal, 21s. to 23s.; gas coke, 34s. 6d. per ton.

MIDLANDS.

Inadequate transport facilities are again obstructing the efficient working of the coal industry. For a short time the difficulty was relieved by the release of rolling stock which had been diverted to the Christmas traffic; but the sharpened demand for house coal has revealed a shortage of wagons which makes traders wonder what will happen if the general trade revival which is so confidently promised really materializes. At present the industries which are the biggest consumers of solid fuel are not working at anything like even post-war normal.

In several instances collieries have had to suspend working because they could not get the output removed by the railways. The explanation which finds most general acceptance is that the railway companies are still using a large number of wagons for the distribution of imported coal for their own purposes. It is inevitable, of course, that, the country being without its usual winter resources in stocks, an abnormal strain should be thrown on the distributing plant.

There has been very little shifting of the market position. A stimulated demand for house coal has made prices firm. At the other end of the scale there is an increased output of slack, with easy market conditions. Nuts, likewise, are plentiful. Further contracts for industrial coal have been made at pre-dispute prices; but there is no general reversion to that level. Furnace cokes remain very firm at 20s. at the ovens. Foundry cokes continue to depreciate.

Reduction in Price at Harrogate.—The Harrogate Gas Company announce a reduction in the price of gas to that ruling before the coal stoppage—namely, 9d. per therm, less 10 p.ct. discount. This reduction takes effect from the meter readings for the quarter ended Dec. 31 last.

Tottenham Gas Dividends.—The Directors of the Tottenham District Light, Heat, and Power Company recommend the payment of dividends in respect of the half-year ended Dec. 31, 1926, at the rates of 5½ p.ct. and 5 p.ct. per annum on the preference stocks, 7⅛ p.ct. per annum on the "A" stock, and 6½ p.ct. per annum on the "B" stock—all less income-tax. The rates are the same as for the half-year ended June 30, 1926.

TRADE NOTES.

Valves for Steam Power Plants.

Messrs. J. Blakeborough & Sons, Ltd., of Brighouse, have published a new catalogue of valves and auxiliaries for steam power plants.

Reduction in "Glowworm" Prices.

Conditions in the industrial market are now such as to enable the prices of "Glowworm" cast and wrought iron boilers to be reduced to those prevailing prior to Dec. 1, 1926.

Ammonia Washer for Lancaster.

The tender of Messrs. W. C. Holmes & Co., Ltd., of Huddersfield, for a new ammonia washer for the Lancaster Corporation Gas-Works has been accepted by the Gas Committee.

Drakes, Ltd.

Messrs. Drakes, Ltd., of Halifax, have sent us their latest folder of pamphlets illustrating and describing various items of the plant they manufacture. These pamphlets are splendidly executed.

New Holder for Helston.

The Helston Town Council have had under consideration various improvements to the gas-works. Many new consumers have been added, so that increased storage becomes urgently necessary. The Gas Committee placed the contract for a gasholder and steel tank, and for various alterations, with Messrs. Firth Blakeley, Sons, & Co., Ltd., of Church-Fenton, Leeds.

"Overhead Transmission Lines."

A booklet bearing this title has been published by the British Aluminium Company, Ltd., of Adelaide House, King William Street, E.C. 4. In this it is explained that steel-cored aluminium conductors, which combine the lightness, electrical conductivity, and rustlessness of aluminium with the high strength of the steel, are now employed as overhead conductors on every kind of system from the unobtrusive low voltage distribution line to the most important long-distance transmission lines in the world.

Modern Motor Wagon Weighbridges.

It has become the practice at all the large gas-works to replace their small road weighbridges with larger machines capable of catering for modern road transport. We learn that the Sheffield Gas Company have decided to remove the two machines at present installed at their Neepsend Gas-Works, and in their place to instal the latest type of heavy duty weighbridge of 20 tons capacity, with a platform 20 ft. by 8 ft., as manufactured by Messrs. Charles Ross, Ltd., of Sheffield. Ross weighbridges are becoming popular among large gas and municipal undertakings, on account of their massive construction and their reputation for retaining their accuracy when dealing with the heaviest and most continuous of traffic. Among undertakings who have recently installed similar machines are: The Liverpool Gas Company (six), the Gas Light and Coke Company (five), the Colchester Gas Company, the Urban District of Abertillery, the Borough of Morecambe Gas-Works, the Tottenham District Light, Heat, and Power Company, the Barnsley Gas Company, and the Salford Gas-Works. Messrs. Ross have forwarded their recent weighbridge catalogue. Any reader who desires a copy of this should write to the firm at Aizlewood Road Works, Sheffield.

CONTRACTS OPEN.

Stores, Workmen's Tools, &c.

The Corporation of Ossett are inviting tenders for the supply of materials, stores, tools, &c., for their gas and other departments. [See advert. on p. 275.]

EXTENSIONS.

Halifax Carbonizing Plant.

The Halifax Gas Committee decided last week to recommend the expenditure of £40,000 on alterations and renovations of retorts and kindred plant at the gas-works, to bring everything up to date. The Committee propose to take out a section of the inclined retorts, erected in 1898, and to substitute for them vertical retorts. The scheme will include the raising of the roof of the retort house and the provision of an extra coke conveyor. It is claimed by the Department that, had the whole of the Halifax retort plant used during the present winter been on the vertical system, there would have been a saving of some £10,000 in the coal bill during the dispute period.

Halifax Gas Examiner.—Under the provisions of the Gas Regulation Act, 1920, the right of consumers to nominate a gas examiner was exercised at Halifax, when, on Jan. 13, at the local Quarter Sessions, application was handed to the Recorder (Mr. J. Willoughby Jardine) on behalf of Mr. H. T. Lea, the Halifax Borough Analyst; and the appointment was formally approved by the Court. The remuneration is £115 10s. per annum. Halifax charges on the therm system operate from the end of the financial year (March 31).

Coke Oven Gas for Redcar.—Redcar is proposing to follow the example of the neighbouring town of Middlesbrough by utilizing coke oven gas for public supply purposes. The Town Clerk (Mr. R. McClean) reported to the Town Council on Jan. 13 that, following the re-starting of the coke-oven plant at the Redcar Works of Messrs. Dorman, Long, & Co., he approached the firm informally upon the question. In reply, he had received a letter stating that, by a coincidence, the firm at the same time were considering how they should dispose of the waste gas from the coke-oven plant. They were uncertain as to the quality of the gas produced, and its suitability for the purpose the Corporation had in view, but promised to go fully into the matter,

A Large Donation.

As a result of his experience with the industrial survey of Baltimore, made some years ago at his suggestion, Mr. J. E. Aldred, Chairman of the Board of the Gas and Electric Company and of the Pennsylvania Water and Power Company, has, announces the "American Gas Journal," made a gift of $100,000 to the Massachusetts Institute of Technology, to establish a division of municipal and industrial research, for the application of engineering knowledge to the problems of government, industry, and commerce, in the interests of social and economic growth and progress. The new division is said to be the first of its kind established in an educational institution. Its work is expected to widen the engineering field by giving definite recognition to the important contributions which engineering, economics, and statistical knowledge may make in government administration, and social and business life, directly affecting the comfort and convenience of the public. Undertakings in prospect for the new organization include surveys of industrial developments, rail and water transportation facilities, studies of raw materials, products, and markets, power facilities, and the serious problem of urban and inter-urban traffic regulation in relation to social and business activities. Solution of these and other like problems, it is pointed out, must be based upon actual surveys of conditions in each particular case; and it is such surveys that the new division will undertake.

North Middlesex Preference Stock Issue.—The issue of £30,000 of 6 p.ct. preference stock in the North Middlesex Gas Company which Messrs. A. & W. Richards offered on behalf of the Directors was largely over-subscribed; the tenders sent in amounting to £53,675, at prices ranging from £107 10s. down to the minimum of par.

Birmingham Section of British Industries Fair.—It is officially announced that the Prime Minister has accepted the invitation of the Birmingham Fair Council to visit the Heavy Section of the British Industries Fair on Thursday, Feb. 24. Mr. Baldwin will be entertained at lunch in the Committee pavilion, and will, it is understood, give his personal impressions of the Fair in an address to leading exhibitors and buyers.

Building Trades Exhibition at Leeds.—A valuable feature of a Building Trades Exhibition held recently at Leeds was a series of informal meetings for business men, for the discussion of questions relating to building, town-planning, &c. Opening addresses by experts included talks by Mr. C. S. Shapley, the Engineer and General Manager of the Leeds Corporation Gas Department, and Mr. W. H. Becket, on behalf of the British Commercial Gas Association.

Metropolitan Gas Company of Melbourne.—Messrs. John Terry & Co., of 7, Great Winchester Street, E.C., have received a telegram from their Principals, the Metropolitan Gas Company, Melbourne, Australia, informing them that the net profits for the six months to Dec. 31, 1926, were £134,800. A dividend of 7s. 6d. per share has been declared, an amount of £52,000 has been transferred to the reserve account, and £78,400 has been carried forward. Dividends payable to absentee shareholders will be posted from Melbourne by an early mail.

Workshop Illumination.—The importance of proper illumination in workshops was emphasized at Bolton, on Jan. 12, by Dr. A. G. Park, who said that all workshops and factories, should have a proper system of illumination of such a character that there would be no extra effort needed on the part of the eye. An efficient system was remunerative to employer and worker alike, because bad lighting caused bad work, bad health, and bad temper. There should be no glare, but proper diffusion over the whole room. In engineering works, where there were quick-moving machines, every man should have a light to himself; and any light across a room should be 10 ft. high, so that there would be little chance of shadows or glare.

Stoke-on-Trent and Coke Oven Gas.—An acute controversy has arisen in the Stoke-on-Trent City Council regarding an offer which has been made by the Shelton Iron, Steel, and Coal Company, the largest industrial concern in North Staffordshire, to supply the Corporation with 1,000,000 c.ft. per day of surplus gas from their coke oven plant, at the price of 1s. per 1000 c.ft. At the December meeting of the Council, the offer was refused; but there has been considerable public dissatisfaction, on account of the meagre information which has been given by the Gas Committee in regard to the offer. The matter was raised again at a meeting of the Council on Thursday last on the Gas Committee's minutes. It was urged that other corporations were taking similar supplies, and that Stoke should ascertain what has been the result in these places. After a long discussion, an amendment was carried by a narrow majority that a Special Committee be appointed to make inquiries from other corporations who were taking coke oven gas supplies, and, if necessary, to take expert advice on the matter.

Record Sales of Gas in America.—Messrs. West's Gas Improvement Company, Ltd., of Manchester, have forwarded to us a cable which they have received from the West Gas Improvement Company of America (Incorporated). This states that the sales of gas in America in 1926 constitute a record. In the past five years, the output has increased by 40 p.ct., and 1926 was the best year in the history of the industry. In that year the sales amounted to 459,326 million c.ft.—an increase of 38,000 million c.ft. over 1925. Greater distribution facilities in 1926 enabled the 984 gas companies in America to extend their service to 400,000 new consumers—an increase of nearly 4 p.ct., bringing the total to 11 million domestic customers. Industrial heating and house-heating loads have shown a phenomenal growth. A $500,000 research fund is being used by the American Gas Association to develop the industrial and factory heating business; and equipment and furnaces are being designed which show marked improvement. The gross revenue from the sales of gas in 1926 was $491,776,000—an increase of $39,776,000.

Lighting Trades Staff Dinner and Dance.

By invitation of the Chairman and Directors, the staff of Lighting Trades, Ltd., of Garratt Lane, Wandsworth, S.W., to the number of 128, were, on Friday last, entertained at a dinner and dance at the Piccadilly Hotel. Mr. H. J. Mitchell (the Chairman of the Company) presided at the dinner, and was supported by the other members of the Board. Following the Loyal Toast, Mr. Mitchell expressed his pleasure and that of his co-Directors in again welcoming the members of the staff at this, their fourth, annual social gathering. In the course of a short speech dealing with the Company's position, he made appreciative reference to the loyal support and co-operation of the staff, and expressed the earnest desire of the Board to be personally associated with all functions appertaining to their employees' social welfare. He concluded by according thanks to the staff Committee who were responsible for the evening's arrangements. Mr. A. T. Metcalfe (the General Manager) returned thanks, on behalf of the staff, for the excellent entertainment provided by the Directors. The rest of the evening was spent in dancing.

Fatal Gas Leak at Bury.—Last week, a neighbour, entering a house in Andrew Street, Bury, noticed a smell of gas. She found the occupant, Martha Williams, aged 78, in a weak condition. Efforts to restore the woman with the aid of oxygen proved of no avail, and she died shortly afterwards. The Bury Corporation Gas Department were informed of the escape of gas; and on examination it was found that a 3-in. main under the footpath outside the house was fractured.

London County Council and the Price of Gas.—At last week's meeting of the London County Council, Mr. W. J. Morton (Vice-Chairman of the Public Control Committee) gave the following information in reply to questions by Lieut.-Col. Dodge concerning the prices now charged by the three principal London Gas Companies compared with those before the coal strike: Commercial Gas Company, Gas Light and Coke Company, and South Metropolitan Gas Company, per therm 10·4d., 11·6d., and 10d. respectively; per 1000 c.ft., 4s. 1·4d., 4s. 10d., and 4s. 8d. Quarter to March, 1926, per therm, 9·4d., 9·4d., and 8·75d. respectively; per 1000 c.ft., 3s. 8·65d., 3s. 11d., and 4s. 1d. Dividends reported to have been declared by the Companies for the year 1926 and the previous year were: Commercial Gas Company, Gas Light and Coke Company, and South Metropolitan Gas Company—first half-year, 1925, £2 13s. 4d., £2 13s. 4d., and £2 10s. p.ct.; second half-year, £2 13s. 4d., £2 8s. 8d., and £3 10s.; first half-year, 1926, £2 13s. 4d., £2 10s. 8d., and £2 10s.; second half-year, £2 13s. 4d., £2 10s., not known. No further increases of price have been intimated; but the Gas Light and Coke Company have announced a reduction of 1·4d. per therm as from the meter readings in March next. The Commercial Gas Company are promoting a Bill in the coming session of Parliament to alter the sliding-scale provisions applicable to them.

The Cullen Gas Company, who supply Portknockie and Findochty, have intimated a reduction of 10d. per 1000 c.ft. in the price of gas.

On the recommendation of the Parliamentary Committee, the London County Council have ordered that a petition be sealed and presented, if necessary, against the Commercial Gas Company's Bill.

The Birmingham Gas Committee expressed regret, in a report issued last week, that they were not yet able to lower the price of gas. During the coal stoppage, they purchased 132,770 tons of imported coal.

Photographs of the play in the Corinthians v. Newcastle United Cup-Tie were shown in the windows of the Newcastle-on-Tyne and Gateshead Gas Company's Showrooms at Newcastle, Gateshead, Wallsend, and Chester-le-Street, on Monday last.

At a meeting of the Oswaldtwistle District Council, Mr. Metcalfe said that normal supplies of contract coal were now being received; and the Council should reduce the price of gas immediately the extra cost of coal during the strike had been recovered. Full-page advertisements regarding gas advantages were all very well; but something of a more concrete character was required.

At Halifax Police Court, when a boy was placed on probation in connection with thefts from the gas meter at his father's house, the presiding Magistrate told a Gas Department official present that the Bench were of opinion that meter locks were too easily forced open, and were a great temptation to lads. It was hoped the attention of the Department would be drawn to this matter, with a view to stronger locks being fitted.

The Bradford City Fire Brigade were summoned in the small hours of the morning of Jan. 29 to an outbreak at the Valley Road Gas-Works of the Corporation, where it was found that a stack of coke had been set alight by a quantity of coke which had not been fully extinguished. The fire was considerable; but it was soon put out, and the gas-works were not endangered. The force of a high wind is believed to have been largely responsible.

For a quarter of an hour, just about tea time one evening recently, the town of Halifax found itself without electric light. Minds at once turned to the repeated electricity breakdowns reported from Huddersfield, and the new linking-up scheme with Halifax; and the thought, not unnaturally, was that Halifax was now being victimized by the whimsicalities of electricity. There was much hunting for candles on the part of people who imagine gas is gone for ever; and the trams were held up. Next day people learned that the cause of all the bother was that somebody at the electricity works had pulled out the wrong switch. Later in the evening there was a real breakdown in the Savile Park district, for about an hour, owing to a defect in the mains.

STOCK MARKET REPORT.

THERE was a subdued tone on the Stock Exchange last week consequent on the situation in China, and movements were of a restricted character. Less confidence was expressed in the probability of an early reduction in the Bank Rate; but there was considerable optimism regarding the future of trade and industry.

The gilt-edged market was moderately busy, and there were large dealings in the new 4 p.ct. Consols and the new Nigerian 5 p.ct. scrip, both of which are quoted at a premium. An attractive new issue is the £2,500,000 5 p.ct. South Australian Loan at 98. European reconstruction loans were firm, and the French Sterling Railway bonds moved upwards.

Very little information is obtainable in the Gas Market. The publication of the Gas Light and Coke Company's accounts shows that the amount to be carried forward is £43,341 less than a year ago; but taking into account the amount transferred from the Brentford Company's account, £134,475, and £100,000 transferred from the Special Purposes Fund, the deficit on the year's working is £277,816. Of this sum £35,000 has, however, been applied for redemption of capital. The figures of the other two Metropolitan Companies are not available at the time of writing; but the South Metropolitan Company are recommending a dividend of 7 p.ct. per annum for the half-year, making 6 p.ct. for the year. This is the same rate as for the previous year. The Tottenham Company have recommended the same rates as for the previous half-year—viz., 7⅝ p.ct. per annum and 6½ p.ct. per annum on the "A" and "B" stocks respectively.

The only changes of importance in the quotations were a rise of 2 points on the British ordinary, 1 point on the Commercial 3½ p.ct., and ½ point in the South Metropolitan ordinary. Newcastle consolidated were marked down 1 point at the local exchange.

Tenders for the £30,000 6 p.ct. Preference Stock of the North Middlesex Company amounted to £53,675, and ranged from £107 10s. p.ct. to par. At the maximum price the stock yields £5 11s. 7d. p.ct.

The following transactions were recorded during the week:

On Monday, Bombay 21s., Brighton and Hove 10 p.ct. 167½, British 105¼, 106, 7 p.ct. preference 114½, Commercial 4 p.ct. 84½, European 6⅜, Gas Light and Coke 86, 86¼, 86⅜, 4 p.ct. preference 76⅝, 6 p.ct. debenture 102¼, Imperial Continental 131½, Primitiva 14s. 6d., 14s. 9d., 14s. 9¾d., 14s. 10¼d., 14s. 11¼d., 15s., South Metropolitan 95½, 96¼, 96½, South Suburban 5 p.ct. 99⅛, 99½, Southampton 5 p.ct. 77⅞, Tottenham "B" 91½. Supplementary prices, Eastbourne 3½ p.ct. "B" 103½, Gas Light and Coke 5 p.ct. debenture 99½, 99⅛, Leatherhead 5½ p.ct. debenture 99½.

On Tuesday, Alliance and Dublin 82½, 4 p.ct. debenture 65½, Bombay 21s. 3d., Croydon sliding-scale 98, 99, maximum dividend 80½, 81, Gas Light and Coke 86, 86¾, 3 p.ct. debenture 59⅛, Imperial Continental 131½, 132½, Newcastle 3½ p.ct. 70, Primitiva 14s. 9¾d., 14s. 10½d. 15s., 15s. 0¾d., 15s. 1½d., 15s. 3d., South Metropolitan 95¾. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99⅛, Liverpool 5 p.ct. 80.

On Wednesday, Aldershot 4 p.ct. preference 68, Bournemouth "B" 12⅜, Gas Light and Coke 86, 86½, 3 p.ct. debenture 60, Imperial Continental 131½, 3½ p.ct. debenture 68¾, Newcastle 3½ p.ct. 70, Primitiva 15s. 1½d., 15s. 3d., 15s. 4½d., South Metropolitan 95¾, South Suburban 5 p.ct. 99⅜. Supplementary prices, Kednill 5 p.ct. debenture 97.

On Thursday, Bombay 21s., Commercial 4 p.ct. 84, 3½ p.ct. 83, European 6⅜, Gas Light and Coke 86, 86¼, 86⅜, 86½, 4 p.ct. preference 76½, 77⅜, 3 p.ct. debenture 58½, 59⅛, Imperial Continental 132, Primitiva 15s., 15s. 1½d., 15s. 3d., 15s. 4½d., South Metropolitan 95⅜, 96½, 96⅜, 3 p.ct. debenture 58. Supplementary prices, Kedhill 5 p.ct. debenture 97.

On Friday, Bournemouth 3 p.ct. debenture 55, 56, European 6⅛, 6 7/16, Gas Light and Coke 86⅜, 86½, 86⅜, 86⅞, 87, 3 p.ct. debenture 59⅜, Imperial Continental 133, Primitiva 14s. 10½d., 15s., 15s., 1½d., 15s. 3d., South Metropolitan 96½, 3 p.ct. debenture 59⅝, 6½ p.ct. debenture 102½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99⅜, Metropolitan (Melbourne) 9 1/16, Watford "B" 93.

In Lombard Street at the close of the week the short loan market experienced an unusual degree of stringency, which resulted in borrowing from the Bank of England. The clearing banks renewed old day-to-day loans at 4 p.ct., but in other quarters up to 4½ p.ct. was charged. Treasury Bills were allotted at a higher average rate—£4 4s. 4·63d. p.ct., or just over 2s. p.ct. above the previous week's rate.

The Foreign Exchange market was quiet, and there were no extreme variations in the quotations. The French rate, following a further advance in the dealing rate of the Bank of France, closed slightly higher at 123·05. Belgas receded to 34·88, and Italian lire finished ⅜ up at 113. Sterling on New York was firm at 4.85 3/32. The Dutch exchange eased to 12.13½, and the German declined to 20.47½.

The price of Gold in the open market remained at 84s. 11½d. Silver receded slightly, the price being 7/16d. down at 26½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3, 1925. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Jan. 28.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a.	% p.a.				
171,978	Stk.	Aug. 12	5	5	Aldershot 5 p.c. max. C. .	72—76	..	..
322,992	,,	,,	4	4	Do. 4 p.c. Pref. .	67—72	..	68
1,551,868	,,	Sept. 30	6½	6½	Alliance & Dublin Ord. .	80—85	..	82½
374,690	,,	Jan. 13	4	4	Do. 4 p.c. Deb. . .	65—68	..	65½
300,000	1	Oct. 14	1/7½	1/7½	Bombay, Ltd.	1—1½	..	21/—21/3
170,000	10	Aug. 26	8½	8½	Bournemouth 5 p.c. . .	12—13	..	12⅝
500,050	10	,,	7	7	Do. B 7 p.c. . .	12—13	..	..
275,000	10	,,	6	6	Do. Pref. 6 p.c. .	11—12	..	..
50,000	Stk.	Jan. 13	3	3	Do. 3 p.c. Deb. .	53—56	..	55—56
163,025	,,	,,	4	4	Do. 4 p.c. Deb. .	73—76	..	..
314,740	,,	Aug. 26	12	12	Brighton & Hove Orig. .	168—168	..	167½
344,200	,,	,,	9	9	Do. A Ord. .	125—130	..	..
1,387,500	,,	July 22	5	5	Bristol 5 p.c. max. . .	84—85a	..	..
855,000	,,	Sept. 30	7	8	British Ord.	106—109	+2	105½—106
100,000	,,	Dec. 30	7	7	Do. 7 p.c. Pref. . .	112—117	..	114½
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. .	68—73	..	..
100,000	10	Dec. 9	8	6	Cape Town, Ltd. . . .	7—8	..	..
100,000	10	Oct. 28	4½	4½	Do. 4½ p.c. Pref. . .	6—7	..	..
150,000	Stk.	Dec. 30	4½	4½	Do. 4½ p.c. Deb. . .	68—73	..	..
626,880	,,	July 22	6	6	Cardiff Con. Ord. . . .	97—100	..	..
1337,860	,,	Dec. 30	7½	7½	Do. 7½ p.c. Red. Deb. .	100—103	..	..
157,150	,,	Aug. 12	6½	5	Chester 5 p.c. Ord. . . .	89—94b	..	..
79,185	1	Sept. 30	†2/-	†2/-	Colombo Ltd. Ord. . . .	27/—29/-	..	..
24,495	1	,,	1/4‡	1/4‡	Do. 7 p.c. Pref. . .	30/—32/-	..	..
321,490	1	Oct. 14	1/9‡	1/7½	Colonial Gas Assn. Ld. Ord.	25/—27/-	..	..
173,900	1	,,	1/9‡	1/7½	Do. 8 p.c. Pref. . .	31/—32/-	..	..
1,818,280	Stk.	Aug. 1	5½	5½	Commercial 4 p.c. Cap. .	82—85	..	84—84½
560,000	,,	,,	5/8/4	5/8/4	Do. 3½ p.c. Cap. .	81—84	+1	83
475,000	,,	Dec. 30	8	8	Do 8 p.c. Deb. . .	54—57	..	..
800,000	,,	Sept. 30	‡2	‡1	Continental Union, Ltd. .	28—33	..	..
200,000	,,	,,	7	7	Do. 7 p.c. Pref. . .	29—35	..	..
137,150	,,	Aug. 12	6½	6½	Croydon sliding scale . .	96—99	..	98—99
408,100	,,	,,	5	5	Do. max. div. . . .	78—81	..	80½—81
492,270	,,	Aug. 26	9	6	Derby Con.	107—109e	..	..
55,000	,,	Dec. 30	4	4	Do. Deb.	73—75e	..	..
800,000	,,	Sept. 16	5	5	East Hull Ord. 5 p.c. . .	78—82	..	..
50,000	,,	Dec. 30	5	5	Eastbourne 5 p.c. Deb. .	90—95	..	..
1,002,180	10	Sept. 30	†4	†3	European, Ltd.	6½—7½	..	6 7/16
16,788,960	Stk.	Aug. 12	4/17/4	5/1/4	Gas Light & Coke 4 p.c. Ord.	86—88	..	86—87
1,600,000	,,	,,	3½	3½	Do. 3½ p.c. max. . . .	59—62	..	..
4,187,020	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	75—78	..	76½—77⅞
5,602,620	,,	Dec. 30	3	3	Do. 3 p.c. Con. Deb. .	58—61	..	58½—60
181,315	,,	,,	—	6	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	102½
180,000	,,	—	10	10	Do. 10 p.c. Bonds. . .	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb. .	..	..	..
82,500	,,	Aug. 26	6⅜	6⅜	Hastings & St L. 5 p.c. Conv	87—92	..	..
268,740	,,	,,	5⅜	5⅜	Do. 5⅜ p.c. Conv.	66—71	..	..
70,000	10	Oct. 14	†10	†10	Hongkong & China, Ltd. .	14½—15½	..	..
173,200	Stk.	Sept. 16	5	5	Hornsey Con. 5½ p.c. . .	69—71	..	..
1,976,000	,,	Nov. 11	†10	10	Imperial Continental Cap.	131—134	..	131½—133
226,170	,,	Aug. 12	5½	5½	Do. 5½ p.c. Red. Deb.	68—71	..	68½
235,242	,,	Aug. 12	6½	6½	Lea Bridge 5 p.c. Ord. . .	94—99	..	..
2,127,840	,,	Aug. 12	5½	5½	Liverpool 5 p.c. Ord. . .	79½—80½b	..	..
800,000	,,	Sept. 30	7	7	Do. 7 p.c. Red. Pref.	102—105b	..	..
165,736	,,	Aug. 26	8	9	Maidstone 5 p.c. Cap. . .	112—117	..	..
68,480	,,	Dec. 30	3	3	Do. 3 p.c. Deb. . .	52—57	..	..
75,000	5	Dec. 9	†7	†7	Malta & Mediterranean .	5½—5⅝	..	..
541,920	Stk.	Nov. 25	†6	†6	Montevideo, Ltd. . . .	79—82	..	..
2,061,815	,,	Aug. 12	5	5	Newcastle & Gateshead Con.	69½—70½d	−1	..
360,929	,,	,,	4	4	Do. 4 p.c. Pref. .	70—72d	..	..
939,705	,,	Dec. 30	3½	3½	Do. 3½ p.c. Deb. .	67½—67⅞d	..	..
15,000	,,	Aug. 26	11½	11½	North Middlesex 10 p.c. .	155—160	..	..
91,530	,,	,,	8⅗	8⅗	Do. 7 p.c. .	109—114	..	..
800,000	,,	Nov. 25	7	9	Oriental, Ltd.	97—102	..	..
188,120	,,	Dec. 30	7¼	7¼	Plym'th & Ston'house 5 p.c.	105—110	..	..
414,500	,,	Aug. 26	—	7/4/0	Portsm'thCon.Stk.4p.c Std.	102—107	..	..
296,732	,,	,,	—	5/0/0	Do. 5 p.c. max.	78—81	..	..
9,389,909	1	,,	—	—	Primitiva Ord.	14/9—15/9	—/9	14/6—15/4½
282,300	100	Dec. 1	4	4	Do. 4 p.c. Red. Deb. . .	84—86	..	..
600,000	Stk.	Jan. 27	4	4	Do. 4 p.c. Red. Deb. 1911	69—71*	−2	..
434,363	,,	Dec. 30	—	4	Do. 4 p.c. Cons. Deb. . .	69—71	..	..
150,000	10	Sept. 30	6	6	San Paulo 6 p.c. Pref. . .	7½—8	..	..
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	47—50	..	..
270,000	Stk.	Sept. 16	6	5⅜	Sheffield A	96—98e	..	..
419,966	,,	,,	6	5⅜	Do. B	96—98e	..	..
1,047,000	,,	,,	6	5⅜	Do. C	96—98e	..	..
90,000	10	June 11	4	—	South African	4—6	..	..
6,669,893	Stk.	Aug. 12	7	5	South Met. Ord.	95—97	+½	95¼—96½
1,895,446	,,	Jan. 13	3	3	Do. 3 p.c. Deb. . .	57—60	..	58—59⅜
734,000	,,	Sept. 16	6½	6½	Do. 6½ p.c. Red. Db.	101—103	+1	102½
91,500	,,	Aug. 12	8½	8½	South Shields Con. . . .	114—116d	..	..
1,187,795	,,	Aug. 12	6½	6½	South Suburban Ord. 5 p.c.	97—100	..	99¼—99⅜
868,892	,,	Dec. 30	5	5	Do. 5 p.c. Deb.	93 96	..	..
647,740	,,	Oct. 14	5	5	South'mpton Ord. 5 p.c.max	75—78	..	77½
191,275	,,	Dec. 30	4	4	Do. 4 p.c. Deb.	68—73	..	..
250,000	,,	Aug. 26	7	7	Swansea 7 p.c. Red. Pref. .	100—102	..	..
200,000	,,	Dec. 30	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	+2	..
120,000	,,	July 22	7⅜	7⅜	Tottenham District A 5 p.c.	105—110	..	..
882,975	,,	,,	6½	6½	Do. B 8½ p.c.	89—92	..	91½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	99—101	..	..
181,356	,,	Dec. 9	4	4	Do. 4 p.c. Deb.	72—75	..	..
258,251	,,	Aug. 26	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, &	69½—70½d	..	..
197,294	,,	Aug. 26	6⅜	6⅜	Wycombe 5 p.c. . . .	85—90	..	..
88,330	,,	,,	5	5	Do. 5 p.c. pref. .	82—87	..	..
91,800	,,	,,	6⅜	6⅜	Do. 5 p.c. Maidenh'd	85—90	..	..
80,000	,,	July 8	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. .	122—127	..	..
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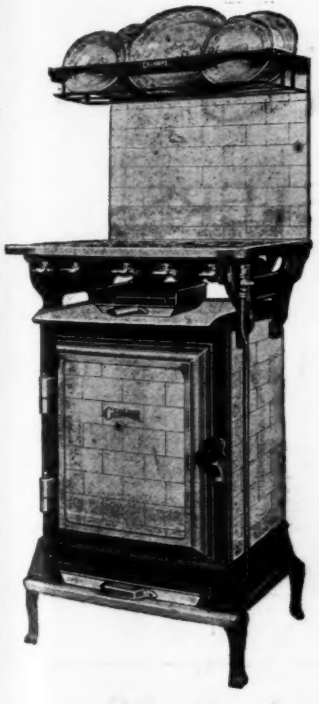

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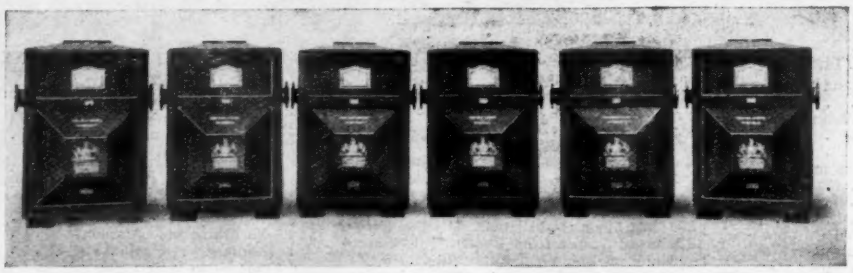

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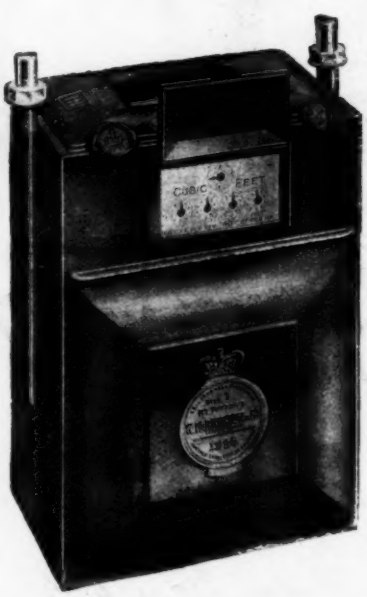

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